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THESIS

AUTOMATED MANPOWER ANALYSIS
AND
PERSONNEL MANAGEMENT SYSTEM (AMA/PMS)

by

Cynthia E. Schwind

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Manpower analysis must be performed on a continual basis at all Naval activities. Each command must identify, through manpower analysis, future manning shortfalls and take appropriate actions to alleviate them.

This thesis presents the data and functional requirements, and logical database design for an Automated Manpower Analysis and Personnel Management System (AMA/PMS). Object oriented database design methodology was used to define data and functional requirements of the system.

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Automated Manpower Analysis
and
Personnel Management System (AMA/PMS)

by

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Submitted in partial fulfillment
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In a peacetime environment of increasing budget cuts resulting in reduced manning levels, active management of limited manpower assets is vital to ensure mission accomplishment and battle readiness. Manpower analysis is the process by which an activity's manpower assets are matched to or balanced against authorized billets to determine strengths and weaknesses in manning structure.

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I. INTRODUCTION

A. BACKGROUND

Manpower end-strengths, both military and civilian, for the Department of the Navy, are authorized annually by Congress and reflected in the Secretary of Defense's (SECDEF) Six Year Defense Program (SYDP). Identification of future manpower requirements is an integral part of the Planning, Programming, and Budgeting System (PPBS) process. Manpower requirements are determined by force structure, weapons systems configurations, warfare tasking and support thereof.

In a peacetime environment of increasing budget cuts resulting in reduced manning levels, it is vital that limited manpower assets be actively managed to ensure mission accomplishment and battle readiness. Manpower analysis is the process by which an activity's personnel assets are matched to or balanced against authorized billets to determine strengths and weaknesses in manning structure.

The activity commander must be aware, at all times, of how his/her manning structure (personnel assigned) balances against the activity's billet structure (job organization). Manpower assets must be monitored not only for current status but also for future required manning levels based on

mission requirements and operational commitments. Assignment of personnel to an activity normally requires four to seven months lead-time. Therefore, manning shortfalls cannot usually be relieved quickly and must be planned for well in advance to ensure mission readiness.

A case/example helps illustrate this point. An overseas, isolated Naval activity had a billet authorization (BA) for a single Utilitiesman (UT2) with a critical 6104 Naval Enlisted Classification Code (NEC), air-conditioning (AC) repair. It is vital to mission accomplishment that at least two of the three air-conditioners for climate control in the computer building be operational at all times. The nearest available civilian contract AC repair support was six hours automobile drive from the activity. No other military support was available at a shorter distance.

Two weeks before the assigned UT2's projected rotation date (PRD), the command suddenly realized they had no relief on board or anyone ordered in as relief. The incumbent UT2 could not be held at the activity as his presence was required for onboard relief at his next duty station. Through intervention of their Immediate Superior in Command (ISIC), the manning control staff of Commander in Chief Atlantic Fleet, and the Enlisted Personnel Management Accounting Center (EPMAC), a relief was detailed to and received by the activity two days prior to the incumbent's departure.

Had this activity performed manpower analysis on, say, a monthly basis, they would have recognized well in advance of the UT2's PRD that an onboard relief was critical to mission accomplishment and could have solved the problem long before intervention by senior commands was required.

On the other hand; if performed properly, manpower analysis can result in early identification and resolution of potential manning problems as the following case illustrates. This case is for a shore activity with a requirement for approximately a dozen Data Processors (DPs). These DPs worked with a mainframe computer which was used 24 hours a day for real-time data analysis. The computer room was required to be manned 24 hours a day, on a rotating basis, by qualified watch-standers. At least four months on the job training was required to qualify an individual to go on the watch bill.

By conducting manpower analysis, the Division Officer was able to verify the readiness of his division. The majority of his DPs were female, limited duty personnel (because of pregnancy) received from ships. The remainder of his division were male and female permanently assigned petty officers and seamen.

About the time the limited duty personnel were finished qualifying for watch, they were placed on restricted work hours by medical (precluding watch standing duties) followed shortly thereafter by maternity leave. Generally these

individuals did not return to the shore activity at the end of their convalescent leave, but returned to full duty onboard their ships, thereby limiting the number of qualified watch standers to the few permanent party DPs.

Because proactive manpower analysis was performed, the shore activity was able to show precisely the impact on current and future mission readiness of this limited duty assignment policy. Through close work with the DP detailing staff at Naval Military Personnel Command (NMPC), this activity was able to have the number of limited duty assignments to them drastically reduced and the required number of regular PCS DPs restored.[1]

B. PROBLEM STATEMENT

Upper echelon Navy staffs have trained personnel assigned specifically as manpower analysts. At the lower echelon staff and activity levels, however, the responsibility for manpower analysis falls to the Executive Officer, Department Heads, and Division Officers who, generally, have had no formal training in this process.

Few Naval officers are formally or even informally trained in the manpower analysis process, yet this is a vital part of effective management of scarce personnel

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[1] By policy, medical limited duty personnel are not to be counted against normal BA. However, this activity found that the quantity of onboard permanently assigned DPs was substantially below NMP.

resources. Normally, when an officer reports for duty to an activity, he/she receives turnover/passdown as to the mission of the command and division/department. This passdown generally includes a list of personnel assigned to that work area and a description of the duties each performs. Rarely is an officer given a copy of the authorized billet structure for his/her division/department or shown how the personnel assigned relate to that billet structure.

Generally, formal manpower analysis is performed at the higher echelon staff levels, usually by officers assigned specifically as manpower analysts. If manpower analysis is performed at the activity level, it is usually by personnel who happen to use manpower analysis techniques because of previous work experience in that area. An activity's manpower analyst should have an understanding of the complexity of the command's operational mission and administrative support requirements; how the billet structure is determined; what quantity of billets are required for full mission readiness; why there is a difference between Billet Authorizations and Billet Requirements; why a specific rating mix of personnel is assigned; and how the number of personnel assigned is determined. Knowledge of each of these areas is required in order to perform effective manpower analysis at any activity level.

The primary problem with the current system of manpower analysis employed at the activity level in the Navy is that Manpower Analysis training is not part of the formal officer training program. Most junior officers (LCDR and below) do not know what a Manpower Authorization (MPA) is or how to read it. Additionally, few officers ever see an Enlisted Distribution Verification Report (EDVR) or Officer Distribution Control Report (ODCR) or Manpower Document until they reach the Department Head or Executive Officer level. Generally, only those officers assigned duties as manpower analysts, such as Aviation Maintenance Officers in aviation squadrons, are ever required to use manpower analysis documents in the management of their workcenter, division, or department. Usually officers are completely unaware of their authorized billet structure and rely strictly on the roster of personnel assigned to them in order to identify workcenter structure. This lack of knowledge of manpower analysis documents and techniques results in poor planning for future manning needs. Formal manpower analysis is often not even done at a divisional or departmental level.

C. OBJECTIVES

The general objective of this thesis is to define the activity level manpower analysis process and to present a design for an automated database for performing this

process. This objective will be accomplished by presenting a functional description of manpower analysis, fully defining data inputs for the analysis process, and providing examples of possible outputs of the system used by various levels of a Naval activity. It is envisioned that automating the manpower analysis process at the activity level will readily accomplish education on the importance and the mechanisms of the process.

D. RESEARCH QUESTIONS

The area of research is limited to respond to four questions:

1. From a staff, organizational, and departmental or divisional level, what functional requirements must be addressed to support effective activity level management of manpower resources?
2. What data elements are required to evaluate an activity's manpower profile?
3. What manpower reports are required at each management level of an activity to support manpower planning and management?
4. What additional personnel administration areas can be addressed with this system and what modifications will be required?

E. SCOPE AND LIMITATIONS

This thesis will provide background information on the Department of Defense/Navy (DOD/DON) manpower development process and a description of the documents used at the activity level for manpower analysis. Functional and Data requirements for activity level manpower analysis will be identified, and a logical database design presented. Examples of outputs and reports will also be included.

The scope of this thesis is limited to system analysis and design. It does not include implementation of the proposed design or building of a prototype.

F. METHODOLOGY

Object oriented database analysis and design methodology will be used to define functional and data requirements and to present a logical database design. This methodology will be described in Chapter III, User Requirements.

Functional and data requirements for this system will be based on the author's professional experience as a U.S. Navy Manpower Analyst for six and one-half years at the Echelon three, four, and five levels: Commander Oceanographic System Atlantic (primary billet - 1983-85); Commander Helicopter Tactical Wing One (1985-88); and Naval Air Station, Agana, Guam (1980-81), respectively.

G. ORGANIZATION OF THESIS

This thesis is organized as follows:

Chapter II, entitled "Manpower Management in the Navy", reviews the Department of Defense/Navy (DOD/DON) level processes for determining activity manpower requirements. Views of manpower from the three upper levels of management at an activity will be presented and the documents required for activity level manpower analysis will be reviewed. Reports generated by the manpower analysis process will be presented within the context of management views of manpower.

Chapter III, entitled "User Requirements", reviews the methodology used to define data and functional requirements, develops the objects to be stored in the database, and determines the processes that create, modify and display these objects. Using data from several sources, a database is defined which contains information on personnel assigned to an activity and the activity's billet structure. The database system, once designed, will process the information from the database to produce a series of predefined reports or respond to ad hoc queries on the database.

Chapter IV, "Design", presents the logical database design using Object Oriented methodology and the Relational Database Model. Using this methodology, objects identified in the previous chapter are transformed into a relational

diagram. Data flows and report outputs of the system are also specified in, Appendices C and D, respectively.

Chapter V, entitled "Summary and Conclusions", provides a brief review of the previous four chapters and presents suggestions for alternative functionality of the system.

Appendices A through C provide Object Diagrams, Object Specifications and Object Oriented Data Flow Diagrams, respectively, developed during the Requirements Analysis phase. Appendix D provides Sample Forms/Data Input/Display Screens and Reports designed for data input and modification and data output, respectively. Appendices E and F were developed during the design phase of this thesis and provide a graphic, Appendix F, and literal description of relationships between the Objects presented in Appendix A. Appendix G defines system requirements for Update, Display, and Control Mechanisms. Appendix H illustrates the system Menu Hierarchy and provides sample menus for the system. Appendix I provides Pseudo Code for the Menu Hierarchy as well as for the reports generation procedures.

II. MANPOWER ANALYSIS

Chapter I provided a brief background on the manpower analysis process and the importance of that process. This chapter reviews the Department of Defense/Navy (DOD/DON) level processes for determining activity manpower requirements. Views of manpower from the three upper levels of management at an activity are presented, and the documents required for activity level manpower analysis are reviewed. Reports generated by the manpower analysis process are presented within the context of management views of manpower.

A. DEPARTMENT OF DEFENSE/NAVY (DOD/DON) MANPOWER PROGRAMMING

Manpower requirements for the DOD/DON are determined, in part, by the authorized configuration of weapons systems, force structure, warfare tasking, and support thereof. A Naval activity's billet structure is, therefore, directly linked to the Department of Defense's (DOD) Planning, Programming, and Budgeting System (PPBS). Initiated annually, the PPBS operates on an eighteen month cycle. Events in this cycle lead directly to the development and authorization of Navy manpower.

1. DOD Planning, Programming, and Budgeting System (PPBS)

The President, National Security Council, Joint Chiefs of Staff (JCS), and DOD evaluate the threat to national security based on intelligence collected. The JCS then develop a strategy to meet these threats to national security and promulgate it in the Joint Strategic Planning Document (JSPD) to the Secretary of Defense (SECDEF). The SECDEF then issues guidance to the Military Departments in the areas of Fiscal Policy, Material Support Planning, and Preparation of the Program Objective Memorandum (POM). The military departments submit POM to the SECDEF in response to this guidance. The POM submissions contain recommendations as to the forces and resources required to support national defense objectives as well as the rationale for these recommendations and risk assessments. Once force requirements have been determined, manpower requirements necessary to support the forces are established. [Ref. 1:Chap. 3].

2. DOD POM

POM submissions are fiscally constrained and developed by fiscal year. Planned forces are programmed for eight fiscal years, and the manpower to support the forces is programmed for six fiscal years. "Upon receipt of the POM submissions from each Military Department, the SECDEF

requests the JCS to prepare the Joint Program Assessment Memorandum (JPAM)". [Ref. 1:Chap. 3]. After analyzing the POM submissions and the JPAM, the SECDEF issues Program Decision Memorandum (PDMs) which include intended adjustments to the POM submissions. The Military Departments submit budget estimates based on Program Decision Memorandum to the SECDEF. After evaluating of these budget estimates, by SECDEF and Office of Management and Budget (OMB). SECDEF develops "... Decision Package Sets and submits the DOD budget as part of the President's budget to Congress".[2] [Ref. 1:Chap. 3]. Figure 2-1 illustrates this PPBS process. Figure 2-2 illustrates the entire Manpower Requirements Determination Process.

B. DON MANPOWER REQUIREMENTS DETERMINATION

1. Operating Forces

In the Department of the Navy (DON), determining the manpower requirements for operating forces, i.e. ships, submarines, and aviation squadrons, is a complex process based on established engineering standards and other methodologies. Beginning with an operating unit's Required Operational Capability (ROC) or mission statement, and the Projected Operational Environment (POE) or specific operating scenario, then determining operating and

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[2]Budget decisions are contained in Program Budget Decision (PBDs) and Defense Management Review Decisions (DMRDs).

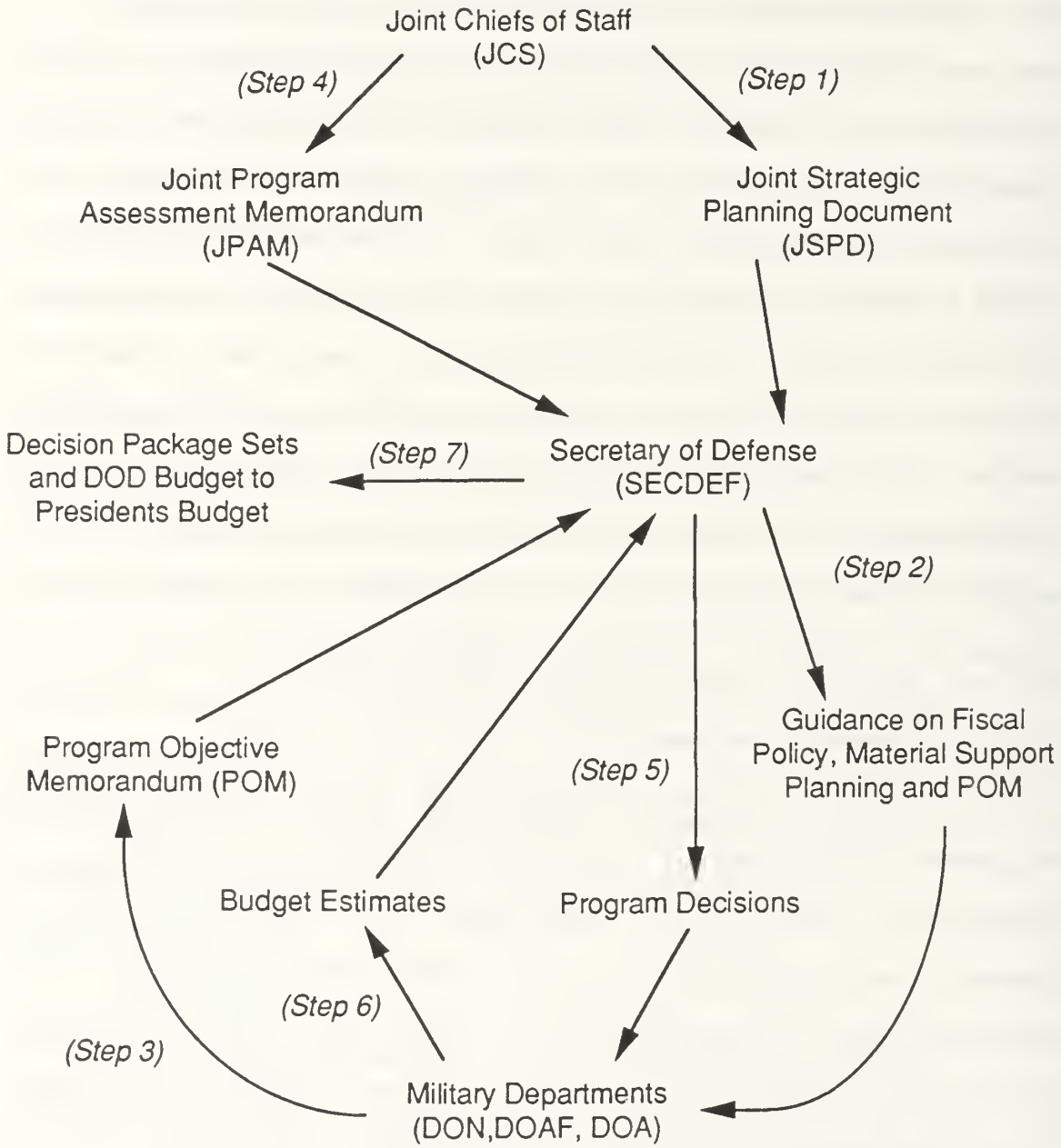


Figure 2-1: PPBS Process

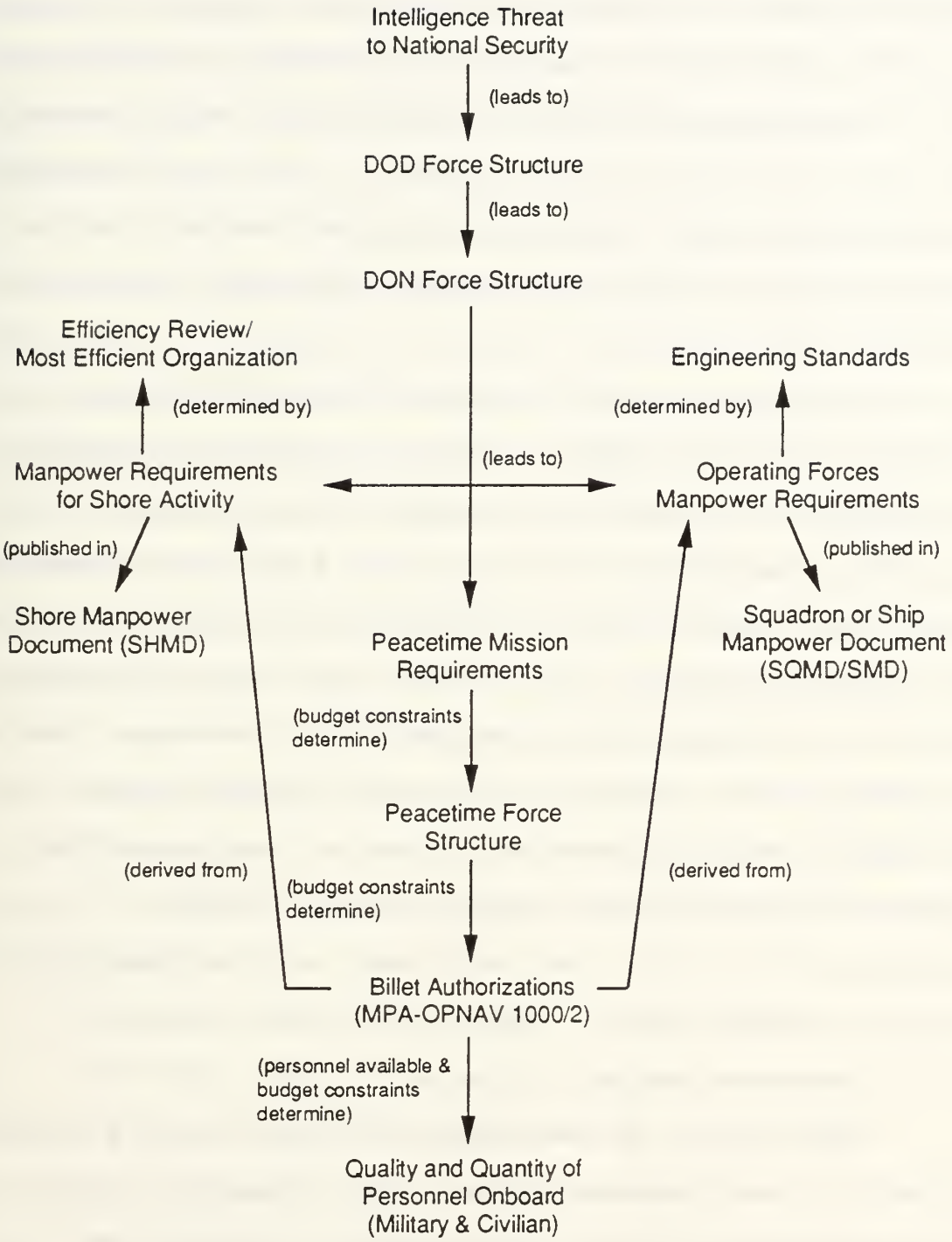


Figure 2-2: Manpower Requirements Determination

maintenance requirements for equipment installed at that unit to support the ROC/POE, the manpower analyst can apply a set of algorithms and engineering standards to determine the billet/manpower quality and quantity mix required for the unit to be fully mission capable. The wartime or full mission requirement billet structure for each unit in the operating force is then published in the unit's Manpower Document.

Each Ship Manpower Document (SMD) and Squadron Manpower Document (SQMD) identifies the "minimum wartime qualitative and quantitative manpower requirements to support accomplishment of all assigned missions and Required Operational Capabilities in the Projected Operational Environment ROC/POE". [Ref. 1:Chap. 2]. These documents delineate, by departmental and divisional breakdown, the required officer and enlisted billet structure for an activity. This structure is defined in terms of officer warfare designations and grade; enlisted ratings, subspecialties or NECs, and paygrades; and the quantity required of each.

2. Shore Activities

The mission of Navy shore activities is to provide support to the operating forces. This support includes, but is not limited to, mission areas such as supply, fire fighting, intelligence, aircraft/ship rework, and staff

administrative activities. These support functions are not directly related to the operations of war-fighting hardware; therefore, the manpower effort required to provide these services cannot be measured by hardware engineering standards.

The current method being used by DON to determine shore facility billet structure is the Efficiency Review (ER) process. Completion of ERs on all Naval shore activities is scheduled for FY 1994. From this process the Most Efficient Organization (MEO) which "defines the minimum quality and quantity of manpower required to produce the output(s) established in the activities Performance Work Statement (PWS)" will be derived. [Ref. 1:Chap. 3]. "The Objective is to develop a manpower requirements baseline to use as a basis for programming all shore manpower requirements". [Ref. 1:Chap. 2]. The end result of this entire process will be a Shore Manpower Document (SHMD), similar in structure to the SMD and SQMD, for each U.S. Navy shore activity.

3. Manpower Authorization (MPA) (OPNAV 1000/2)

The next step in the manpower process is to determine peacetime mission requirements for all Naval activities, operating forces and shore activities. From these requirements, the peacetime force structure (ships, submarines, and aircraft, etc.) and shore facilities

structure are determined within budgetary constraints set by Congress. The Manpower Authorization (MPA) (OPNAV 1000/2) outlines Chief of Naval Operations (CNO) approved and funded billets for each Naval activity based on budgetary constraints, warfare priorities, and manning policies. Currently the DON's goal is to have billet authorization (BA) levels at 91.5 percent of requirements for operating forces (deployable, military personnel only) and 90 percent or less of requirements for shore facilities (combined military, civilian, and civilian contract personnel). [Refs. 2 and 3].

4. Personnel Levels

The actual number of personnel assigned for duty to a Naval activity at any given time is determined by a complex set of factors, the explanation of which is beyond the scope of this thesis. It is sufficient to understand that the quality and quantity mix of personnel assigned to an activity ranges from 70 to 88 percent of BA, with each activity receiving its "fair share" of Navy personnel assets as determined by the Navy Manning Plan (NMP) for Enlisted personnel and the Officer Navy Manning Plan (ONMP). [Refs. 2 and 3]. Because there is a difference between BA levels and actual personnel on board, it is vital that managers recognize this fact and manage these limited assets to ensure mission accomplishment and combat readiness.

C. PRESENT SYSTEM - ACTIVITY LEVEL MANPOWER ANALYSIS

1. Personnel and Billet Data Sources

The location of Naval personnel, based on official Permanent Change of Station (PCS) orders is maintained in database systems at the Consolidated Data Center (CDC) in Cleveland, Ohio. These systems are the Naval Enlisted System (NES) and the Officer Personnel Information System (OPINS), commonly referred to as the Enlisted Master File and the Officer Master File. However, direct access to these databases is restricted to the upper echelons of the DON.

Lower echelon activities such as ships, aviation squadrons and Naval bases do not have direct access to these database systems. Therefore, in order to fully analyze their manpower, data from several sources, internal and external to the command, are required. Internal documents include the personnel service records and personnel rosters. Externally generated documents used in activity level manpower analysis include the following:

a. Manpower Authorization (MPA) (OPNAV 1000/2)

The Manpower Authorization (MPA), produced by the Navy Manpower Data Accounting System (NMDAS), is used to fully identify the peacetime and mobilization billet structure of an activity. Two MPAs are published for each

command, one for officer billets and one for enlisted billets. Both are divided by department and division, and the billets assigned to each are delineated.

Billets are identified by Billet Sequence Code (BSC) and Billet Title. Each billet is then assigned specific enlisted rating and Primary and Secondary Naval Enlisted Classification codes (PNEC/SNEC) requirements or officer warfare designator, grade, and subspecialty codes, if applicable. The authorized peacetime quantity for each billet is specified for the current Fiscal Year (FY) and subsequent five FYs.

MPAs for an activity must be reviewed when the activity receives a new edition in order to identify or verify changes, if any, which have occurred to the authorized peacetime or wartime billet structure. Changes to an activity's billet structure are also identified through correspondence from the appropriate resource sponsor. For example, changes would include notification that an NEC is to be to be applied to specific ratings or notification granting authority to establish a new department within an activity and providing its associated billet structure.

b. Enlisted Distribution Verification Report (EDVR)

The Enlisted Distribution Verification Report (EDVR), produced by NES, is received monthly by each Naval

activity with enlisted personnel assigned. This document lists assigned enlisted personnel alphabetically by last name and alphabetically by rate. Information provided on each person includes his actual rating and assigned rating (rating detailed against), PNEC/SNEC held and distributed against, Projected Rotation Date (PRD), End of Active Obligated Service Date (EAOS), Active Duty Service Date (ADSD), and Social Security Number (SSN). Prospective personnel gains and losses are also identified by name and rate and estimated date of arrival or departure, respectively. The activity's billet authorization level and current month and nine month projected onboard manning levels are also provided as well as the NMP allotment for each rating.

c. Officer Distribution Control Report (ODCR)

The Officer Distribution Control Report (ODCR), produced by OPINS, also published monthly, lists officers assigned to a command by BSC and Billet Title. Grade, designator, subspecialty, date of rank, PRD, sex, and SSN are also provided.

Information on officer and enlisted personnel is also gleaned from Permanent Change of Station (PCS) orders and an individual's Personnel Record.

d. Detailing of Personnel

Although officers are officially detailed to a specific billet within their activity, they may actually be assigned to a different billet by their Executive or Commanding Officer once they report for duty. Enlisted personnel are generally not detailed to a specific billet, but to an opening for a specific rating and paygrade or NEC requirement. There are exceptions to this system for enlisted personnel such as directed manning for Command Master Chief, Command Career Counselor billets and other high interest or controlled billets. When an enlisted member reports to an activity he/she is assigned to a department or division. The officer in charge of his/her work unit then assigns specific duties to be performed by the individual.

2. Activity Management Levels

There are three levels of management in an activity that are concerned with billet/personnel management:

a. Executive Level

This level consists of the Commanding Officer (CO), Executive Officer (XO), and selected Executive Assistants such as the Command Career Counselor (CCC) and Command Master Chief (CMC).

b. Department Heads

Department Heads are officers who are assigned responsibility for a major mission component of an activity such as Operations, Weapons, or Administration. Department Heads are assigned responsibility for managing several subordinate officers and numerous enlisted personnel who are grouped into functional subareas, called divisions, within a department.

c. Division Officers

Officers at this level of management are assigned responsibility for a division within a department. A division includes numerous enlisted personnel of varying rates.

3. Management Views of Manpower

The Executive Level, specifically the CO and XO, view enlisted manpower differently from the other two levels of management discussed above. The CO and XO generally view enlisted manpower in terms of the quantity of personnel onboard in each department or division; percentages of personnel onboard versus Billets Authorized (BA); a specific comparison of the number of billets and personnel assigned per department and division; and projected shortfalls and end strength.

Officer manpower, on the other hand, is viewed from this level in terms of an individual assigned against a

specific billet, as well as overall current and projected officer manning levels. The Executive Officer of a command is responsible for the billet assignment of officers. The other members of the Executive Level, the CCC and CMC, deal primarily with career development, and morale and welfare of enlisted personnel, respectively.

Department Heads and Division Officers view enlisted manpower in terms of BA versus personnel assigned ratios as well as specific enlisted billet assignments. Department Heads and Division Officers must actively project future manning levels against specific billets to ensure combat readiness and mission accomplishment.

4. Manpower Analysis Process

As mentioned previously, manpower analysis is the process by which an activity's personnel assets are matched to or balanced against its authorized billets. Often the manpower analysis and reports generation process at an activity is a manual process performed by an officer assigned as the Command Manpower Analyst or by an individual Department Head or Division Officer for their respective department, division, or work centers. These reports can take anywhere from a few minutes to several hours to produce manually, depending on the data required and the accuracy, currency, and availability of the data.

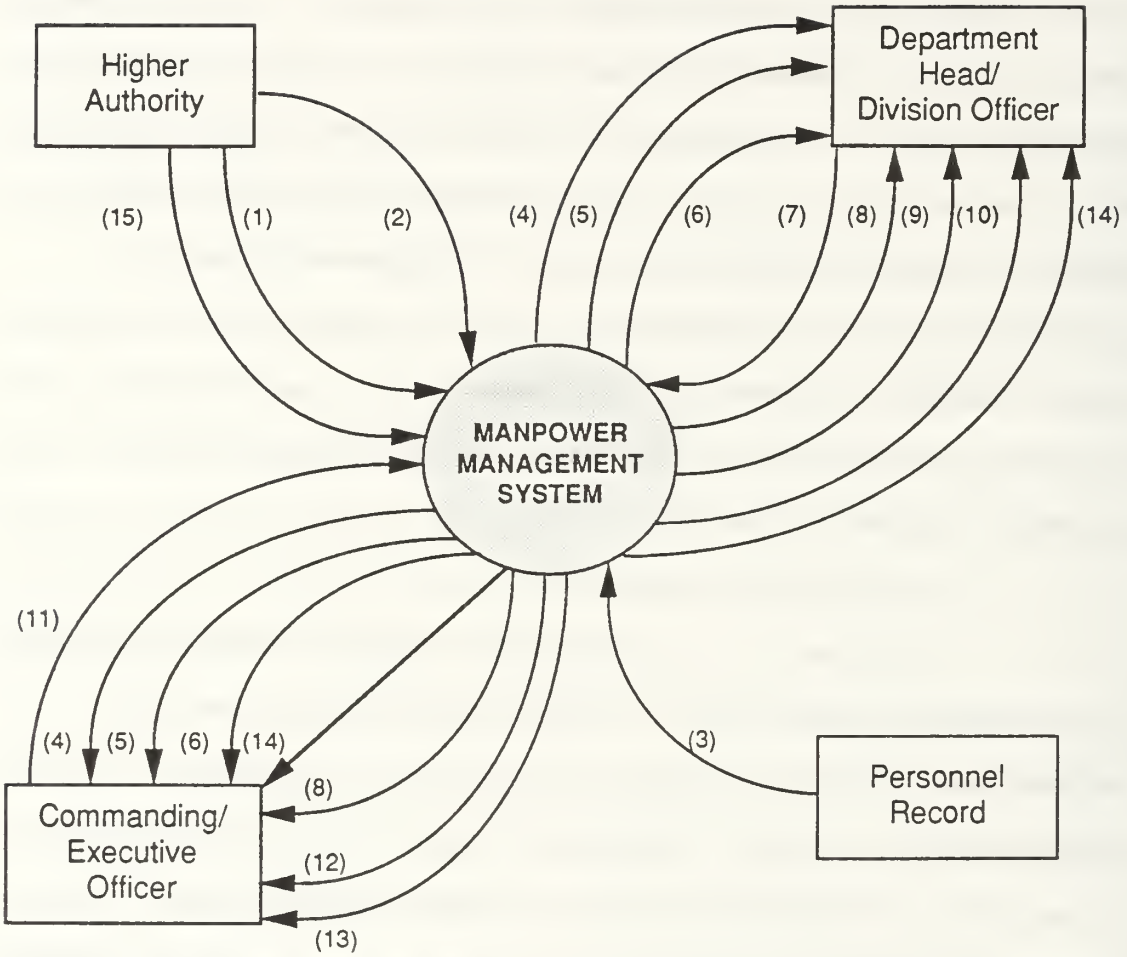
Because of the time lag between NES and OPINS database updates, publishing dates, and receipt of the EDVR and ODCR by an activity, there are frequently discrepancies between data in these documents data in and the individual's personnel record. The same is also true for NMDAS and the MPA. Information gleaned from the MPA, EDVR, ODCR, PCS orders, Personnel Records, billet assignments, and personnel/billet correspondence from higher authority is used to manage billets and manpower within an activity. Figure 2-3 illustrates the flows of data through the manpower analysis system.

a. System Data Flows

Figure 2-3 illustrates a general view of activity level manpower analysis. Sources and sinks as well as senders and receivers of data within the system are represented by boxes. The term 'Higher Authority' refers to an activity at an echelon higher than the activity performing manpower analysis. These Higher Authorities are responsible for making decisions on billet structure and assignment of personnel for subordinate activities.

Higher Authority activities, in the context of this thesis, are as follows:

- Chief of Naval Operations (OP-12), responsible office for MPA changes as



LEGEND

(1) Billet Data (MPA & Notification Letter)
(2) Personnel Data (ODCR,EDVR)
(3) Personnel Data (Personnel Record)
(4) Department Status Report
(5) Division Status Report
(6) Designator/Rating Status Report
(7) Enlisted Billet Assignment
(8) Grade/Paygrade Status Report
(9) Department Manning Report
(10) Division Manning Report
(11) Officer Billet Assignment
(12) Officer Manning Report
(13) Officer Status Report
(14) Personnel Gains/Losses Report
(15) Officer and Enlisted PCS Orders

Figure 2-3: Manpower Analysis Process Data Flow Diagram

directed by resource sponsors and manpower claimants.

- Resource Sponsors, offices within OPNAV responsible for ensuring resources are available in the various warfare communities for mission accomplishment.
- EPMAC, performs placement for all active and Training and Administration of Reserves (TAR) enlisted duty personnel; detailing of non-designated airmen, seamen, and firemen; NEC management; production and distribution of EDVR using NES.
- Naval Military Personnel Command (NMPC), responsible for detailing and placement of officers, and detailing of all other enlisted personnel.

Data flowing from Higher Authority will include billet information and personnel assignment information.

Data flowing from the Commanding Officer/Executive Officer (CO/XO) source to the system will normally include only officer billet assignments. Information flowing to the CO/XO sink will be the various manpower analysis reports produced by the system and required by this level of management. These reports will be discussed in Section 5 of this chapter.

Division Officers and Department Heads will provide data to the system concerning enlisted billet assignments. As a data sink, this level of management will use reports generated by the system.

Data from the Personnel Record will be used by the system to update the database, but no information or data will be sent from the system to the personnel record.

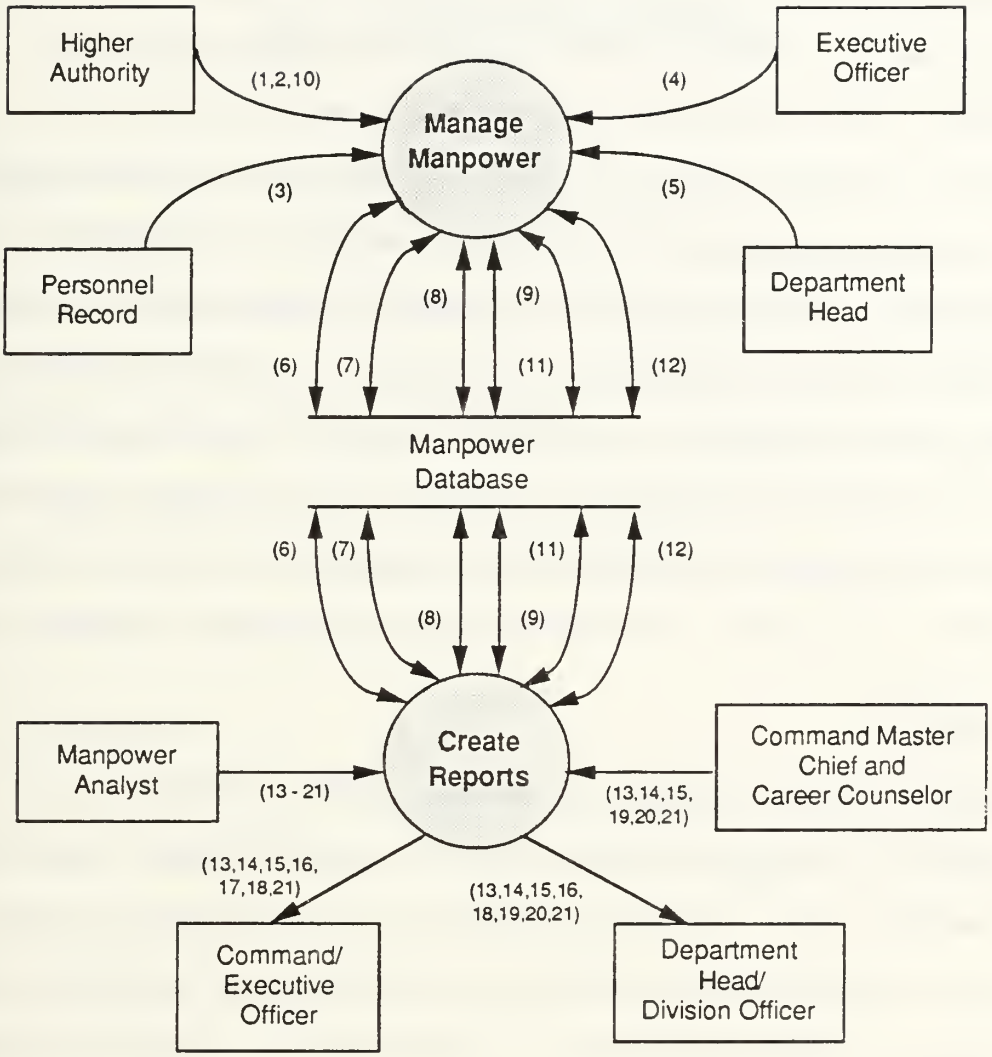
b. Major System Components Data Flows

Figure 2-4 illustrates the flow of data into and out of the two major components of a manpower analysis system. These major components are the processes for managing billet and personnel data and for creating reports.

The data management process encompasses mechanisms for adding new data, modifying existing data, and deleting data which is no longer required. The primary purpose of any database is to maintain data for use by decision makers. The manpower analysis process ultimately produces reports for the users which present various consolidated views of an activity's manpower. Additionally, the database should be capable of providing simple lists of groups of data as well as responses to ad hoc queries.

5. Reports

Reports generated by the manpower analysis process are reflections of the management views of manpower. Reports on officer manpower would include a break-down of



LEGEND

(1) Billet Data (MPA) and Notification Letter
(2) Personnel Data (ODCR, EDVR)
(3) Personnel Data (Personnel Record)
(4) Officer Billet Assignment
(5) Enlisted Billet Assignment
(6) Officer Billet Data
(7) Enlisted Billet Data
(8) Officer Record
(9) Enlisted Record
(10) Officer and Enlisted PCS Orders
(11) Department Billet Structure
(12) Division Billet Structure
(13) Grade/Paygrade Status Report
(14) Designator/Rating Status Report
(15) Department Status Report
(16) Division Status Report
(17) Officer Status Report
(18) Officer Manning Report
(19) Department Manning Report
(20) Division Manning Report
(21) Personnel Gains/Losses Report

Figure 2-4: Subprocesses Data Flow Diagram

personnel by paygrade and/or rank, billet summary by department/division, and a designator summary. Enlisted reports would include essentially the same break-down profiles. Both officer and enlisted reports provide strictly numeric views of the information in the database as well as views of specific billet/personnel assignments. Appendix D provides samples of reports illustrating views of the data normally required by activity level management. (These reports will be discussed in detail in Chapter III). Not all levels of management need to see the same levels of detail in a report; therefore, the manpower data must be combined, analyzed, and presented in different formats.

D. SUMMARY

This chapter provided background information on the DOD/DON level manpower requirements determination processes. At the DON level, several documents are generated which, if used by an activity, provide all of the data necessary for effective manpower analysis. The manpower analysis process was summarized and an overview of reports generated by the process was presented.

Chapter III reviews the methodology used to define data and functional requirements, develops the objects to be stored in the database, and determine the processes that create, modify and display these objects.

III. SYSTEM REQUIREMENTS

This chapter defines the data and functional requirements for an automated manpower analysis system. Using data from several sources, a database is created which contains information on personnel assigned to an activity and the activity's billet structure. The database system will then process the information from the database to produce a series of predefined reports or to respond to ad hoc queries on the database.

A. METHODOLOGY

Object oriented methodology is used to define data and functional requirements for the database system. Using this methodology, the entities in the user's work environment are represented as objects to be stored in the database. An entity is any item in the user's work environment about which information is required to be stored. For example, an Officer would be an entity in a Naval activity's personnel management environment. The characteristics of each object are defined in terms of the data elements to be stored.

Functional requirements for the database system are defined through the use of Data Flow Diagrams (DFDs). DFDs present graphically how each object in the user's work

environment is created, modified, deleted, and displayed. DFDs also illustrate who is authorized to do what to each object and, within the user's work environment, to whom information from the system is given.

1. DATA REQUIREMENTS DEFINITION

Using object oriented methodology, the systems analyst must first identify those 'objects' in the user's environment that must be maintained and define their structure. An object is defined as a "... named collection of properties that sufficiently describes an entity in the user's work environment." A property is a "... characteristic of an entity that is important to one or more users of the database application ...", such as a person's name or rank.[3] "An entity is something the user perceives to be an independent unit...", such as a department or an officer. [Ref. 4:Chap 4].

a. Object Definitions

To define the objects in the user's environment for the AMA/PMS, both system outputs and entities in the user's work environment were examined to fully identify the characteristics or properties to be maintained by the system. These objects represent a consolidated view of the entities and their characteristics in the user's

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[3]A property of an object may also be another object. In this case it is called an object property.

environment, a Naval activity. All Naval activities are divided into departments which are then divided into divisions. Some divisions are then further divided into workcenters (for the purpose of this thesis, an activity will be subdivided only to the division level). Personnel are assigned to work within specific departments and divisions at an activity. The manpower of a Naval activity is viewed in terms of billet structure and personnel onboard.

From the object oriented view of activity manpower, six entities are identified in the user's work environment of Manpower/Personnel Management about which data must be maintained. For the AMA/PMS these entities are defined as the objects: DEPARTMENT, DIVISION, OBILLET (officer billet), EBILLET (enlisted billet), OFFICER, and ENLISTED. Appendix A graphically presents the properties of each object.

b. Object Specifications

Once the objects have been defined, object specifications are developed.

> "Object specifications consist of two parts: object definitions and domain definitions. An object definition lists all the properties of an object and indicates the domain from which values for each property may be drawn. Domain definitions specify formats, lengths and special restrictions on the values of each domain". [Ref. 4:Chap 4].

Object Definitions and Domain Definitions are presented in Appendix B.

c. Object Descriptions

(1) Department and Division Objects. The billets[4] within an activity are divided into Departments and then subdivided into divisions. For example, the Aviation Maintenance Department would include divisions called Scheduling, Avionics and Electronics. The DEPARTMENT object is identified by Dname. This object contains the object properties of DIVISION, OBILLET, EBILLET, OFFICER, and ENLISTED, all of which may be multivalued.

The DIVISION object is identified by DivName. This object also contains the object properties of OBILLET, EBILLET, OFFICER, and ENLISTED, as well as the non-object property Dname. Again, each of these object properties may be multivalued.

(2) Billet Objects. Billets are categorized as requiring either an officer or an enlisted person to be assigned. The objects defined to represent these entities are OBILLET and EBILLET. Billet data is obtained from the Manpower Authorization (MPA) OPNAV 1000/2 or via official correspondence from a Resource Sponsor which identifies changes to an activity's billet structure, hereafter

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[4]The billet structure of an activity defines the job organization. Therefore, a billet is a specific element of the work breakdown structure of the activity.

referred to as a Notification Letter. Billet data is entered into the system to create, modify, or delete a unique instance of OBILLET or EBILLET objects. These instances of OBILLET and EBILLET objects are then grouped to create instances of DEPARTMENT and DIVISION objects.

The OBILLET and EBILLET objects contain several identical properties. Both objects are identified by a Billet Sequence Code (BSC) which is unique to each instance of that object. Each contains properties called Billet Title; Billet Authorization (BA), the number of billets authorized for that BSC; Department Name (DName); and Division Name (DivName). All billets are assigned to a department, but not all billets are assigned to a specific division. Several billets may be assigned to an area within the department commonly referred to as Departmental Administration.

The OBILLET object contains properties for Grade and Designator (indicating the rank and warfare designator, respectively), ideally required for that billet. Additionally, one or more instances of OFFICER object may be associated with a specific instance of the OBILLET object.[5]

Properties within the EBILLET object are Rating, an alphanumeric acronym for an enlisted technical

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[5]More than one officer may be temporarily assigned to a single instance of OBILLET during periods of personnel turnover and reassignment.

rate and paygrade; paygrade; Primary or Secondary Naval Enlisted Classification (PNEC/SNEC) code, a numeric code specifying a technical subspecialty within a specific rating; BA; Dname; and DivName. One or more instances of ENLISTED object may be associated with a single instance of EBILLET object.[6]

(3) Personnel Objects. Members of the Armed Forces are either Commissioned Officers or Enlisted Personnel. Personnel data gleaned from the Officer Distribution Control Report (ODCR), the Enlisted Distribution Verification Report (EDVR), Permanent Change of Station (PCS) orders, Personnel Service Records, and personnel data input or change forms (as created and used by each activity) is entered into the system to create, modify, and delete unique instances of OFFICER and ENLISTED objects.

Each instance of the OFFICER object is identified by the individual's SSN. This object contains the properties of Name, Grade, Projected Rotation Date (PRD), and Date of Rank, as well as the object properties of DEPARTMENT and DIVISION. The property Collateral Duties may be multivalued and describes the non-billet duties assigned to an officer such as Urinanalysis Officer or Navy Relief Coordinator. The object properties, OFFICER, DEPARTMENT,

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[6]More than one Enlisted person may be temporarily assigned to an instance of EBILLIT during periods of turnover and reassignment.

and DIVISION are single valued, however, the object property of OBILLET may be multivalued as an officer may be assigned to more than one billet.

The ENLISTED object is identified by SSN for each instance in the database. Other properties in this object include Name, Rating, Paygrade, Rate, PNEC, SNEC, PRD, End of Active Obligated Service (EAOS) date, Date of Rank, and Time in Service. As Enlisted personnel are initially assigned to a department and division then to a billet, these object properties are included. An enlisted member may only be assigned to a single department or division at a time but may be assigned to more than one billet. The property Collateral Duties is multivalued. These non-billet duties may include assignments such as Watch Section Leader or Training Petty Officer.

d. Management Views of Objects

The Executive level of a command views the activity as a collection of DEPARTMENT objects, each of which is divided into a collection of DIVISION objects. Each of these objects is viewed as containing several instances of OBILLET and EBILLET objects. From this level, OBILLETs are viewed as containing instances of OFFICER object. Enlisted personnel are viewed as belonging to a specific instance of DEPARTMENT or DIVISION object.

Lower management levels of a command, i.e., Department Heads and Division Officers, view the activity in terms of a specific instance of a DEPARTMENT or DIVISION object and the OBILLET and EBILLET objects contained therein. OBILLET and EBILLET objects are then viewed as containing one or more instances of OFFICER and ENLISTED objects, respectively.

Personnel are viewed as instances of OFFICER or ENLISTED objects. At the Executive level, officer personnel are viewed as assigned to one or more specific instances of OBILLET object, and enlisted personnel to a specific instance of DEPARTMENT object or DIVISION object. At the Department and Division levels, enlisted personnel are viewed as assigned to one or more specific instances of EBILLET object. An officer or enlisted individual may be temporarily unassigned to a billet or assigned to a billet with another individual (see previous footnotes).

B. FUNCTIONAL REQUIREMENTS

The AMA/PMS consists of a single application with two main processes, the Manage Manpower process and the Create Reports process. (Appendix C, Figures C-1 and C-2).

1. Manage Manpower Process

This process is divided into two lower level processes, Manage Billet Objects and Manage Personnel Objects. (Appendix C, Figures C-3 and C-4).

a. Manage Billet Objects

This lower level process contains the mechanisms for creating, modifying, and deleting instances of OBILLET and EBILLET objects. Using source documents such as the MPA (OPNAV 1000/2) or notification letters from Resource Sponsors, the user will be able to maintain all billet data used by the AMA/PMS. Instances of OBILLET and EBILLET objects will be created, modified and deleted in this process. Instances of DEPARTMENT and DIVISION objects will be created via the Create OBILLET and Create EBILLET processes. DEPARTMENT and DIVISION objects can be modified and deleted independent of the Update OBILLET and Update EBILLET processes. (Appendix C, Figures C-6 through C-10).

b. Manage Personnel Objects

Using data gleaned from PCS orders, ODCR, EDVR, personnel service records, etc., this process provides the mechanisms for managing the personnel data used by the AMA/PMS. Instances of the OFFICER and ENLISTED objects will be created, modified, and deleted in this process. (Appendix C, Figures C-11 through C-14).

2. Create Reports Process

The second major component of the AMA/PMS is the Create Reports Process. (Appendix C, Figure C-15). By using data stored in the database by the Manage Manpower

Process, the system generates reports. These reports provide various views of the data for use in analyzing an activity's manpower.

Nine standard report outputs are produced by the AMA/PMS. (Appendix C, Figures C-15 thourgh C-21 and Appendix D, Figures D-5 through D-11). There are two general types of reports generated by the Generate Reports process: Manning Reports and Status Reports.

a. Manning Reports

Manning Reports provide information linking an officer or enlisted member directly to one or more authorized billets. The Department/Division Manning Report will be created by drawing required data from instances of ENLISTED object, and DEPARTMENT object. Officer Manning Report will contain information gleaned from instances of OFFICER object and DEPARTMENT object. The Personnel Gains/Losses Report will draw on the OFFICER and ENLISTED objects to produce a report showing those personnel known to be ordered to the activity but not yet received, and those personnel whose PRDs are within six months of the date of the report. (Appendix D, Figures D-5 through D-7).

b. Status Reports

Status Reports provide a numeric overview of an activity in terms of billets authorized and personnel assigned. The system will focus on various properties within

an object depending on the status report being produced. It will then calculate the number of times that property occurs in the instances of an object.

Five status reports are generated by the system. The Officer Status Report provides information on authorized officer billet levels and the number of officer personnel assigned to the activity. The Department/Division Status Report provides the same comparison for enlisted personnel. The Paygrade Status Report is a comparison between the number of billets authorized for each enlisted and officer paygrade and the number of personnel assigned within each paygrade. The Designator/Rating Status Report provides a comparison between the number of billets authorized for each officer designator and each enlisted rate and the number of personnel assigned, broken down by paygrade. (Appendix D, Figures D-8 through D-11).

C. SUMMARY

This chapter provided a brief overview of Object Oriented Database Analysis methodology. Data requirements for the AMA/PMS are presented as Objects in Appendix A, and defined in Object Specifications presented in Appendix B. Function requirements for the system, the data used in these processes and, the objects created and used were examined in detail. Data Flow Diagrams (DFD) for the AMA/PMS are presented in Appendix C.

Chapter IV will present the logical database design using Object Oriented methodology and the Relational Database Model.

IV. DATABASE DESIGN

In Chapter III the functional and data requirements for the AMA/PMS were specified. Using an object oriented database methodology, the entities in the user's environment are represented as objects to be stored in the database. The functional requirements of the system are represented by data flow diagrams showing how objects are created, modified, deleted, and displayed and who is authorized to do what on these objects.

In this chapter, the logical database and application design are presented. In the logical design phase, database objects, as defined in the user's requirements phase, are transformed into a relational diagram. In the application design phase, menu structures, detailed forms and reports, and pseudo code for application programs are developed for the data flow diagrams developed in the user's requirement phase.

A. LOGICAL DATABASE DESIGN

1. Relational Database Model

The Relational Database Model is the approach used to organize the data in the logical design. "The relational database model is based on the concept that data is stored

(at least conceptually) in two-dimensional tables called relations. Each row in the table represents a record", i.e., an instance of an entity. "Each column represents a field" or characteristic of an entity. ". . . A column is called an attribute". [Ref. 4:Chap 5]. Each table is generally referred to as a file.

There are restrictions placed on relations, however. "First, attributes are single valued; neither repeating groups nor arrays are allowed. Second, entries in any column are all of the same kind". [Ref. 4:Chap 5]. For example, for each record (row) in a file (table) there would be only a single entry in the column (attribute) called 'age'. No two records in a file may be identical.

2. Object Relationships

First, in order to convert objects into relations, the analyst examines the relationships among the objects and constructs a preliminary relational diagram. It should be noted that there is not necessarily a one to one correlation when converting objects into relations. Next, all relations are normalized to eliminate modification anomalies. Additional relations will need to be created to to accomplish normalization.

The relationships between relations are determined from the types of objects from which they are derived. These relationships are classified as one to one, one to

many, and many to many, and apply only to the relationship between any two relations. Relationships between relations further are designated as either mandatory or optional.

In a one to one relationship, the key of either relation is placed into the other as a foreign key. In a one to many (parent to child) relationship, the key of the parent is placed into the child relation as a foreign key. An intersection relation is created to represent a many to many relationship. The key of an intersection relation is the composite key of both of the parent relations.

3. Relational Diagram

From the Object Diagram and Object Specifications defined in Chapter III and Appendices A and B, relations and relation definitions are produced. Appendix E is the Relational Diagram for the AMA/PMS. It graphically represents the relationships between relations as derived from the Object Diagrams in Appendix A. Appendix F contains the Relation Definitions and the physical description of the Domain Definitions only.

All of the objects defined for the AMA/PMS, Appendix A, are compound objects. Each contains at least one object property which is either single or multi-valued. The OFFICER and ENLISTED objects are, additionally, composite objects as they contain a multi-valued, non-object property. The intersection relation DIVASSIGN is created to represent

the many to many relationship between DIVISION and OFFICER. The intersection relations OASSIGN and EASSIGN were defined in order to represent the many to many relationship between the compound objects; OFFICER and OBILLET, and ENLISTED and EBILLET, respectively; which contain each other as object properties. The relation COLDUTIES was created to illustrate the composite object relationships between OFFICER and ENLISTED and their multi-valued, non-object property COLDUTY. (Appendix E).

In the Relational Diagram, Appendix E, the key for each relation is indicated by an underlined attribute. A foreign key is identified by an asterisk. The key for an intersection relation is the key for each of the parent relations, indicated by an underline and an asterisk. A mandatory relationship is represented by a bar on the connecting line and an optional relationship by a circle.

4. Normalized Relations

All relations in the AMA/PMS are in Boyce-Codd Normal Form. The relations have been developed to avoid modification anomalies which are undesirable consequences resulting from changing the data in relations. There are three types of modification anomalies: deletion, insertion, and update.

A deletion anomaly is caused when deletion of the facts about one entity inadvertently causes the deletion of

facts about another entity. For example, if, in the AMA/PMS, an officer record is deleted and a billet record is also mistakenly deleted this is a deletion anomaly.

An insertion anomaly would exist if, for example, a billet record could not be entered into the database until an officer or enlisted person was assigned to the billet. This should result in an incomplete database for billet structure.

An update anomaly occurs when redundancy of data is required based on the database structure. For example, if an individual is assigned to more than one billet and a separate record on the individual is created in the file for each billet held. If data needed to be changed on the individual, such as rank, then for each billet record on the individual, a change would have to be made. This requires too much record updating for a simple data change.

To solve these anomalies, using the above examples, three relations would be created; one containing personal information on an individual and one containing billet information, and an intersection relation linking an individual to a specific billet(s).

B. RELATIONSHIP DESCRIPTIONS

1. DEPARTMENT

The DEPARTMENT object is a compound object as it contains the object properties of DIVISION, OFFICER, ENLISTED, OBILLET, and EBILLET. All are multi-valued. Because DEPARTMENT is a compound object, the key to this relation, DName, is placed as a foreign key in each of its child relations. All of the relationships between DEPARTMENT and its child relations are one to many. A DEPARTMENT may have multiple values of DIVISION, OFFICER, ENLISTED, OBILLET, and EBILLET. Each of these child relations is, however, associated with only one DEPARTMENT.

a. DEPARTMENT and DIVISION

The relationship between DEPARTMENT and DIVISION is mandatory/optional. A DIVISION must belong to a DEPARTMENT, but a DEPARTMENT may not have any DIVISIONs assigned, such as the Safety Department in an aviation squadron.

b. DEPARTMENT and OFFICER

The relationship between DEPARTMENT and OFFICER is mandatory/optional. An OFFICER must be assigned to a DEPARTMENT, but a DEPARTMENT might not necessarily have an OFFICER assigned at all times or may have several OFFICERS assigned.

c. DEPARTMENT and ENLISTED

The relationship between DEPARTMENT and ENLISTED is the same as that for OFFICER, one to many and mandatory/optional.

d. DEPARTMENT and OBILLET

The relationship between DEPARTMENT and OBILLET is mandatory/mandatory as all DEPARTMENTS must have at least one OBILLET assigned and an OBILLET is always associated with a DEPARTMENT.

e. DEPARTMENT and EBILLET

Between DEPARTMENT and EBILLET, however, the relationship is mandatory/optional. An EBILLET must be associated with a DEPARTMENT, but a DEPARTMENT need not have any or may have several EBILLETS assigned.

2. DIVISION

DIVISION is a compound object containing the object properties OFFICER, ENLISTED, OBILLET and EBILLET. Each of these object properties is multi-valued. The key to the DIVISION relation, DivName, is placed as a foreign key in each of its child relations.

a. DIVISION and OFFICER

The relationship between DIVISION and OFFICER can be many to many.[7] This relationship is illustrated through

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[7]This is not often done and usually is a result of manning shortfalls.

the creation of an intersection relation called DIVASSIGN. Its key is the composite key, DivName and SSN (SSN is the key to OFFICER). More than one OFFICER may be assigned to a DIVISION, optional relationship, and an OFFICER may be assigned as a Division Officer to more than one DIVISION (also an optional relationship)[8].

b. DIVISION and OBILLET

The relationship between DIVISION and OBILLET is optional/optional. A DIVISION (or workcenter) need not have OBILLETs associated with it, for example the Career Counseling Division, and an OBILLET may be assigned only to a DEPARTMENT and not a DIVISION.

c. DIVISION and ENLISTED/EBILLET

DIVISION is related to both ENLISTED and EBILLET in a one to many, mandatory/optional relationship. An ENLISTED must be assigned to a DIVISION, although it is possible that a DIVISION has no ENLISTED associated. Many ENLISTED may be assigned to a DIVISION, but an ENLISTED person is generally assigned to only one DIVISION.[9]

EBILLET must be associated with DIVISION, however DIVISION need not contain EBILLETs.

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[8]A Department Head is not necessarily a Division Officer.

[9]As stated previously, billets may be assigned to a Department for administrative support.

3. OFFICER and OBILLET

OFFICER is a composite and compound object. OFFICER contains Collateral Duties as a multi-valued, non-object property. This relationship is illustrated by the COLDUTY relation. The composite key of this relation is SSN from OFFICER and Colduty. Certain collateral duties must be assigned to OFFICER, but not all OFFICERs are required to hold collateral duties. Thus the mandatory/optional relationship.

OFFICER contains OBILLET as a multi-valued object property, and OBILLET contains OFFICER in the same manner. This creates compound objects with a many to many relationship. In order to avoid update anomalies, an intersection relation called OASSIGN is created. Its key is the composite key, SSN and BSC (BSC is the key for OBILLET). An OFFICER may be assigned to more than one OBILLET or none at all. OBILLET may be allotted to more than one OFFICER or to none at all.[10]

4. ENLISTED and EBILLET

ENLISTED is a composite and compound object. ENLISTED contains Collateral Duties as a multi-valued, non-object property. This relationship is illustrated by the COLDUTY relation. The composite key of this relation is SSN

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[10]For a period of time two officers may be assigned to the same billet if one is relieving (replacing) the other. A billet may be gapped (unfilled) during manning shortfalls.

from ENLISTED and Colduty. Certain collateral duties must be assigned to ENLISTED but not all ENLISTEDs are required to hold collateral duties. Thus the mandatory/optional relationship.

ENLISTED contains EBILLET as a multi-valued object property, and EBILLET contains ENLISTED in the same manner. This creates compound objects with a many to many relationship. In order to avoid update anomalies, an intersection relation called EASSIGN is created. Its key is the composite key, SSN and BSC (BSC being the key for EBILLET). An ENLISTED may be assigned to more than one EBILLET or not at all. EBILLET may be allotted to more than one ENLISTED or none at all.[11]

C. APPLICATION DESIGN

The application design phase is the final step in logical database design. First, the number of applications and application scope are determined. For the AMA/PMS, there are two applications, Manpower Management and Reports. The Manpower Management application uses all object views specified in Appendix A for data entry, modification, display, and deletion. The Reports application manipulates the data within the database to produce either predefined

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[11]For a period of time two enlisted personnel may be assigned to the same billet if one is relieving (replacing) the other. A billet may be gapped (unfilled) during manning shortfalls.

reports or respond to user ad hoc queries. The application design process entails materialization of objects into data input and display/modify screens and output design. Data outputs are in the form of predefined reports, Appendix D. The scope of the application is specified in Appendix G, Update, Display and Control Mechanisms.

1. Menu Hierarchy

Access to the two AMA/PMS applications will be menu-driven for ease of use. The menu hierarchy, Appendix H, consists of three layers below the Main Menu. The Main Menu provides initial access to either application, Manpower or Reports. Design materializations, input and display/modify screens, and menu logic are presented in Appendices D and I, respectively.

a. Manpower Menu

The Manpower Menu, provides access to the next lower menu layer through either of two paths; Billet Data or Personnel Data.

(1) Billet Data Menu. The Billet Data Menu offers the user the choice to Add New Billet data, Edit Billet Data, or Delete an existing billet record. Any of these three choices leads to the next lower menu layer. If the user desires to Add New Billet data the system, through the Billet Type Menu, will allow the choice of either an Officer or Enlisted Billet data input screen. Selection of

the Edit Billet Data or the Delete Billet option leads to a menu which will allow a choice of three Billet Display formats; by Department, Division, or Billet Sequence Code (BSC).

The Billet Data Menu also provides direct access to the Personnel Data Menu and to the Reports application menu, without requiring the user to return to the previous menu layer; and allows the user to return to the Manpower Menu. The Billet Type and Billet Display menus allow the user to return only to the Billet Data Menu.

(2) Personnel Data Menu. The Personnel Data Menu presents the user with the choice to Add New Personnel data, Edit Personnel Data, or Delete Personnel data. If the user chooses to Add New Personnel an additional menu will provide the user the choice of the Officer or Enlisted Record Type input screen. The Record Type menu allows the user to return only to the Personnel Data menu.

The Personnel Data Menu also provides direct access to the Billet Data Menu and to the Reports application menu, without requiring the user to return to the previous menu layers; and allows the user to return to the Manpower Menu.

b. Reports Menu

The Reports Menu, provides direct selection of the Gains/Losses Report and/or access to the next lower menu

layer through either of two paths; Manpower Reports or Status Reports. Additionally, the user may request Ad Hoc queries against the data base. All reports will be displayed on screen and provide the user the option to print the specified report.

(1) Manpower Reports Menu. This menu provides the user the option of displaying activity enlisted manpower information either by Department or Division. A report of the activity officer manpower is also an option.

The Manpower Reports menu provides direct access to the Status Reports Menu or to the Manpower Menu as well as the previous menu.

(2) Status Reports Menu. This menu presents the user with four options for activity enlisted personnel status reports; by Department, Division, Paygrade, or Designator/Rate. Officer Status Reports is an additional menu option.

The user is provided direct access to the Manpower Reports and Manpower Menus as well as the option to return to the Reports Menu.

D. CONTROL MECHANISMS

The AMA/PMS database will contain information protected under the Privacy Act as well as Combat Readiness related information. It therefore must be protected by a computer security system that as a minimum consists of password

access controls. Additional controls on the system consist of data integrity requirements. Data integrity will be validated against tables which have specified allowable values for data elements such as Rate/Rank, Designator, PNEC/SNEC, and BSC. The presence of data in Name, SSN, PRD, EAOS, etc. fields will be the control mechanism for these data elements. The field for Collateral Duties will be a free-form comments field. Update, Display and Control Mechanisms are specified in detail in Appendix G.

1. Data Input

a. Billets

All fields on the Officer Billet Input screen are mandatory. With the exception of the PNEC and SNEC fields on the Enlisted Billet input screen, all fields are mandatory.

b. Personnel

Mandatory fileds on officers are first and last names, Grade Designator, SSN, and PRD. For enlisted personnel the mandatory fields are first and last name, SSN, Rating, paygrade, Rate, and PRD. All other fields for both inputs are optional.

Billet assignments are either made through the input mode for personnel records or by modifying an existing record.

2. Data Display, Modification, or Deletion

a. Billet

Billet data may be displayed on the screen by specifying Department or Division. The user then scrolls through the data as needed. Billet data may also be displayed by specifying BSC. Once displayed, billet data may be modified on screen or deleted from the database.

b. Personnel

Personnel data may be displayed on the screen by specifying the personnel record desired by SSN or by Name and Grade/Rating combination. Once displayed, personnel records may be modified or deleted from the database.

c. Reports

All pre-defined report formats will be displayed on screen. Information in the reports cannot be modified or deleted from the reports process.

E. SUMMARY

This chapter presented the logical database design for the AMA/PMS using Object Oriented Database Design methodology and the Relational Database Model. All objects specified in Appendix A, were transformed into normalized relations. These relations contain no modification anomalies. The relationships between these relations are illustrated in Appendix E and described in Section B of this chapter. Database control mechanisms are described in

Appendix G. Input/Display screens, Menu Hierarchy and menu samples, and menu logic (pseudo code) are presented in Appendices D, H, and I, respectively.

V. SUMMARY AND CONCLUSIONS

A. SUMMARY

With ever increasing DOD budget cuts, the need to actively manage limited manpower assets is vital to successful accomplishment of the Navy's mission. The information needed for manpower analysis at the activity level is readily available in documents published by higher authority: MPA, ODCR, and EDVR. However, this information is rarely used to manage manpower because of a lack of knowledge on the part of COs, XOs, Department Heads, and Division Officers on the mechanisms and importance of the process.

Failure to manage manpower at the activity level can have serious negative impact on mission/combat readiness. Conversely, proactive manpower analysis can avert serious manning shortfalls.

Object oriented methodology was used to fully define functional and data requirements. Data requirements are presented in Appendix A, Object Diagrams; and Appendix B, Object Definitions. Dataflow diagrams for the AMA/PMS are presented in Appendix C. System output/report formats are

presented in Appendix D. Functional requirements are described in Appendix G, Update, Display, and Control Mechanisms.

The Relational Database Model was used as a design tool. Objects were transformed into relations in Boyce-Codd Normal Form, thereby eliminating all possible modification anomalies. The design specifications are presented in Chapter IV. The Relational Diagram and Relation Definitions are presented in Appendices E and F, respectively. The AMA/PMS is designed to be menu driven. The Menu Hierarchy and Menu Logic (pseudo code) are contained in Appendices H and I.

B. ALTERNATIVE FUNCTIONALITY

The AMA/PMS is designed strictly to manage activity level active duty military manpower. The design can easily be modified, after requirements have been specified, to accommodate civilian and/or reserve manpower.

Additional functionality could be gained by designing system interfaces to allow mainframe to personal computer down-load of billet information from NMDAS, enlisted personnel data from NES, and officer personnel data from OPINS. Some modification of domain definitions would be required to ensure data compatability. This would significantly reduce data input time to the database.

APPENDIX A: OBJECT DIAGRAMS

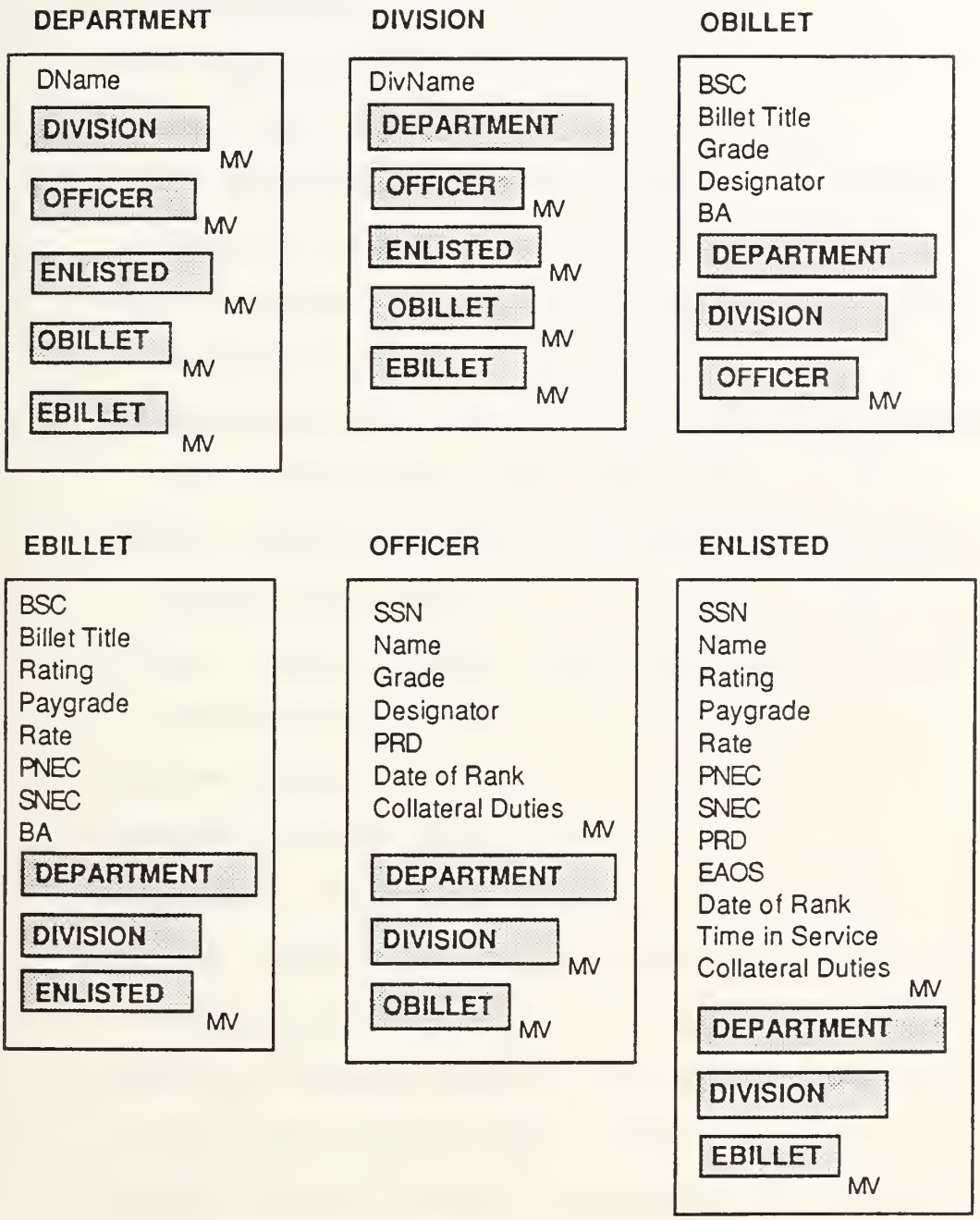


Figure A-1: Object Diagrams

APPENDIX B: OBJECT DEFINITIONS

A. OBJECT DEFINITIONS

1. Department Object

   DName; Department name

   DIVISION; DIVISION object; MV; SUBSET {DivName, OBILLET, EBILLET}

   OFFICER; OFFICER object; MV; SUBSET {Name, Grade, Designator, PRD}

   ENLISTED; ENLISTED object; MV; SUBSET {Name, Rating, Rate, Rank, PNEC, SNEC, PRD, EAOS}

   OBILLET; OBILLET object; MV; SUBSET {BSC, Billet Title, Grade, BA}

   EBILLET; EBILLET object; MV; SUBSET {BSC, Billet Title, Rating, BA}

2. Division Object

   DivName; Division name

   DEPARTMENT; DEPARTMENT object; SUBSET {DName}

   OFFICER; OFFICER object; MV; SUBSET {Name, Grade, Designator, PRD}

   ENLISTED; ENLISTED object; MV; SUBSET {Name, Rating, Rate, Rank, PNEC, SNEC, EAOS}

   OBILLET; OBILLET object; MV; SUBSET {BSC, Billet Title, Grade, BA}

EBILLET; EBILLET object; MV; SUBSET {BSC, Billet Title, Rating, BA}

3. Obillet Object

BSC; Billet Sequence Code

Billet Title; Name of billet

Grade; Officer rank required for billet

Designator; Warfare speciality required for billet

BA; Billet Authorization, number of billets authorized; MV

DEPARTMENT; DEPARTMENT object; SUBSET {DName}

DIVISION; DIVISION object; SUBSET {DivName}

OFFICER; OFFICER object; MV; SUBSET {Name, Grade, Designator, PRD}

4. Ebillet Object

BSC; Billet Sequence Code

Billet Title; Name of billet

Rating; Technical speciality required for billet

Paygrade; Paygrade required for billet

Rate; Alpha-numeric combination of Rating and Paygrade required for billet

PNEC; Primary Naval Enlisted Classification Code

SNEC; Secondary Naval Enlisted Classification Code

BA; Billet Authorization, number of billets authorized; MV

DEPARTMENT; DEPARTMENT object; SUBSET {DName}

DIVISION; DIVISION object; SUBSET {DivName}

ENLISTED; ENLISTED object; MV; SUBSET {Name, Rating, Rank, Rate, PNEC, SNEC, PRD}

5. Officer Object

SSN; Officer's Social Security Number

Name; Officer's full name

Grade; Officer's Rank

Designator; Warfare designator

PRD; Projected Rotation Date

Date of Rank; date promoted to current rank

Colduties; Comments or collateral duties; MV

DEPARTMENT; DEPARTMENT object; SUBSET {DName}

DIVISION; DIVISION object; SUBSET {DivName}; MV

OBILLET; OBILLET object; MV; SUBSET {bsc, billet title}

6. Enlisted Object

SSN; Enlisted's Social Security Number

Name; Enlisted's full name

Rating; Individual's technical speciality

Paygrade; Individual's paygrade

Rate; Alpha-numeric combination of individual's Rating and Paygrade

PNEC; Primary Naval Enlisted Classification Code

SNEC; Secondary Naval Enlisted Classification Code

PRD; Projected Rotation Date

EAOS; Date - End Active Obligated Service

Date of Rate; date promoted to current rate

Time in Service; Number of years, months, days enlisted in Navy

Colduties; Comments or collateral duties; MV

DEPARTMENT; DEPARTMENT object; SUBSET {DName}

DIVISION; DIVISION object; SUBSET {DivName}

EBILLET; EBILLET object; MV; SUBSET {bsc, billet title}

B. DOMAIN DEFINITIONS

1. ba:

   Numeric 4

   Number of Billets Authorized

2. billet title:

   Text 20

   Title of authorized billet as it appears on the OPNAV 1000/2

3. bsc:

   Numeric 5

   Billet Sequence Code as it appears on the OPNAV 1000/2

4. cob:

   Numeric 4

   Number of personnel Currently on Board

5. date:

   Numeric, mask yymmdd,

where yy is any 2 digits, mm is any 2 digits from 01 to 12, dd is any 2 digits from 01 to 31.

6. date of rank:

   Same as number 5 above

7. date of rate:

   Same as number 5 above

8. designator:

   Numeric 4

   Four digit code representing an Officers warfare specialty

9. divname:

   Text 15

   Name of a division as it appears on the OPNAV 1000/2

10. dname:

    Text 15

    Name of a department as it appears on the OPNAV 1000/2

11. grade:

    Text 4, mask XXXX

    where XXXX is one of: FADM, ADM, VADM, RAMU, RAML, CAPT, CDR, LCDR, LT, LTJG, ENS, CWO4, CWO3, CWO2

    Grade title of a Comissioned Officer

12. name:

    text 40: Mask:

first name; Text 15

mi; Text 2

last name; Text 23

Full name of all personnel assigned

13. nec:

Numeric 4

Naval Enlisted Classification Code as found in the NEC Manual or on the OPNAV 1000/2 (used for Primary and Secondary NEC (PNEC/SNEC))

14. paygrade:

Text 5, mask XXXXX,

where XXXXX is one of:E9, E8, E7, E6, E5, E4, E1-E3

Paygrade of Enlisted Personnel

15. pnec:

Numeric 4

See NEC above.

16. pob:

Numeric 4

Projected on Board number of personnel

17. prd:

Text 5, mask AYYMM

where A indicates that an individual is has not yet arrived on board (otherwise this digit is blank), YY is any 2 digits from 00 to 99, and MM is any two digits from 01 to 12

Projected Rotation Date of personnel assigned

18. rate:

Text 5, mask XXXZZ

where XXX is enlisted rate and ZZ is one of: 1, 2, 3, C, CS, CM

Enlisted rating, combination of enlisted technical specialty and rate

19. rating:

Text 3, mask XXX

where XXX is an enlisted speciality rating as found in the NEC Manual.

20. snec:

Numeric 4

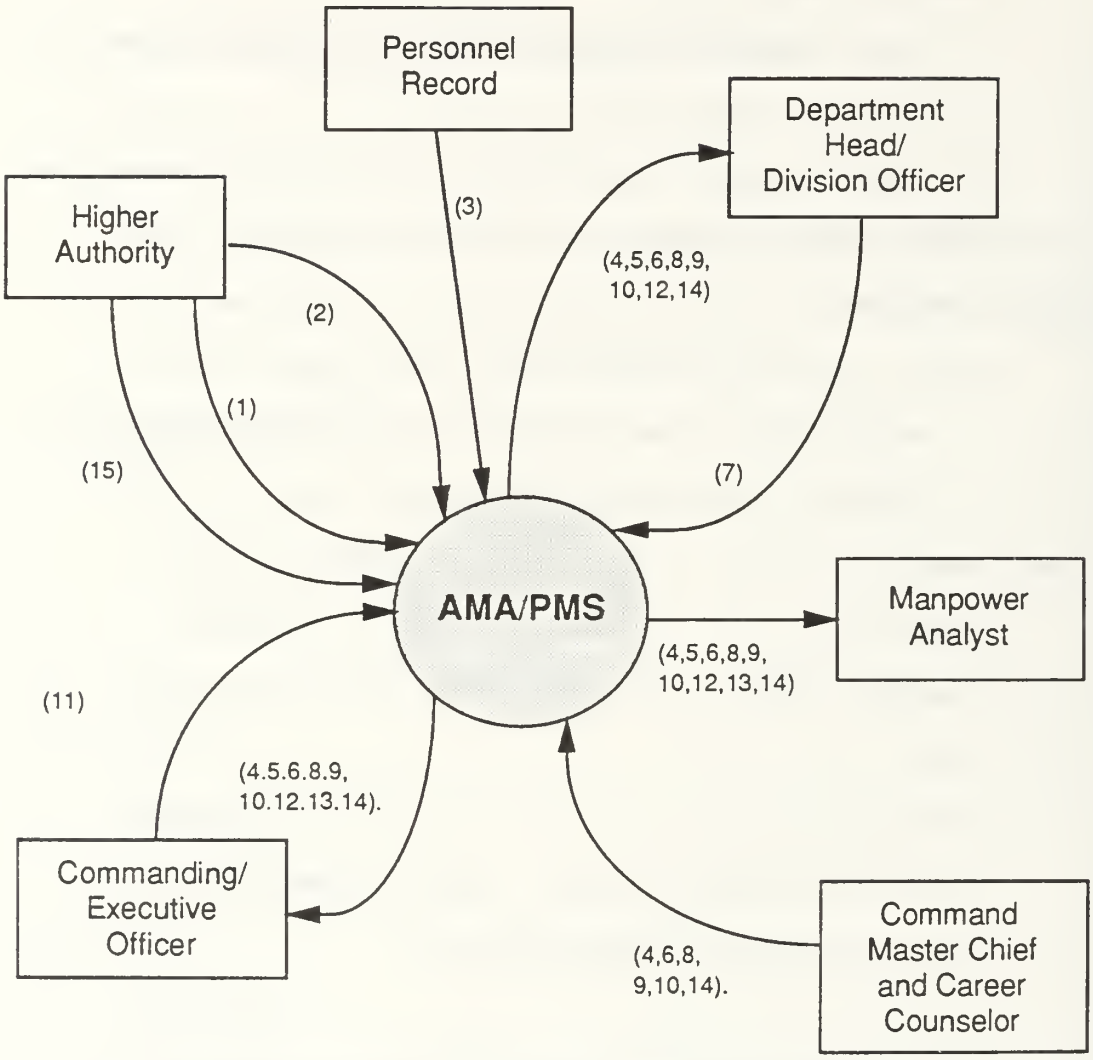
See NEC above.

21. ssn:

Numeric 9

Personnal identification number assigned by the Social Security Administration

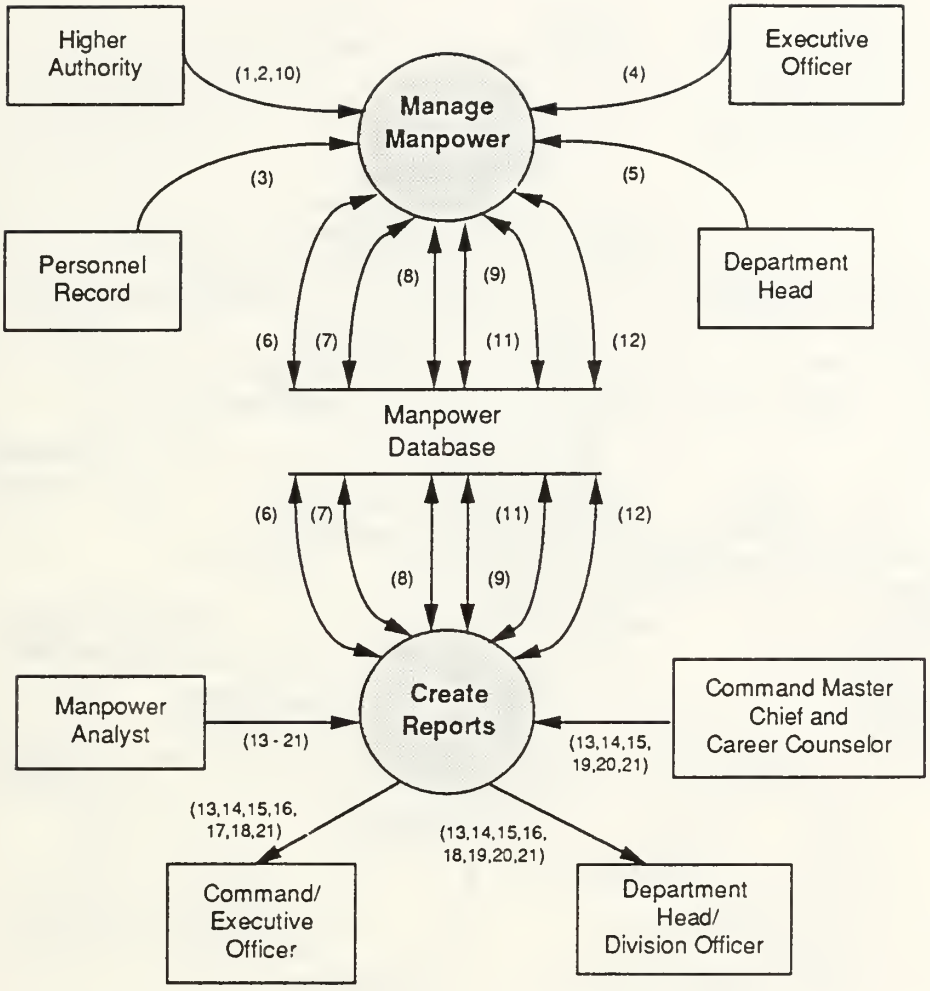
APPENDIX C: DATAFLOW DIAGRAMS



LEGEND

(1) Billet Data (MPA & Notification Letter)
(2) Personnel Data (ODCR,EDVR)
(3) Personnel Data (Personnel Record)
(4) Department Status Report
(5) Division Status Report
(6) Designator/Rating Status Report
(7) Enlisted Billet Assignment
(8) Grade/Paygrade Status Report
(9) Department Manning Report
(10) Division Manning Report
(11) Officer Billet Assignment
(12) Officer Manning Report
(13) Officer Status Report
(14) Personnel Gains/Losses Report
(15) Officer and Enlisted PCS Orders

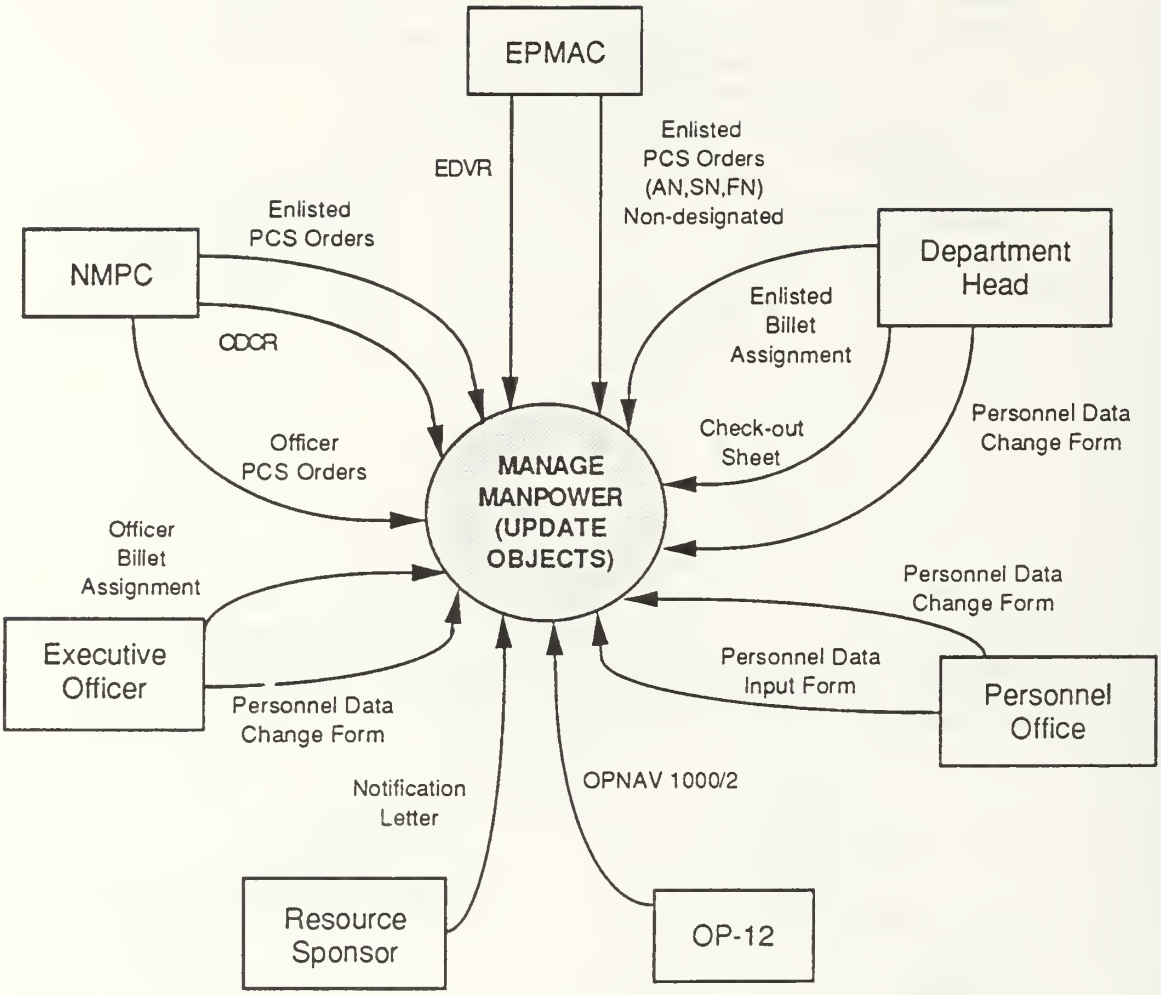
Figure C-1: AMA/PMS



LEGEND

(1) Billet Data (MPA) and Notification Letter
(2) Personnel Data (ODCR, EDVR)
(3) Personnel Data (Personnel Record)
(4) Officer Billet Assignment
(5) Enlisted Billet Assignment
(6) OBILLET Object
(7) EBILLET Object
(8) OFFICER Object
(9) ENLISTED Object
(10) Officer and Enlisted PCS Orders
(11) DEPARTMENT Object
(12) DIVISION Object
(13) Grade/Paygrade Status Report
(14) Designator/Rating Status Report
(15) Department Status Report
(16) Division Status Report
(17) Officer Status Report
(18) Officer Manning Report
(19) Department Manning Report
(20) Division Manning Report
(21) Personnel Gains/Losses Report

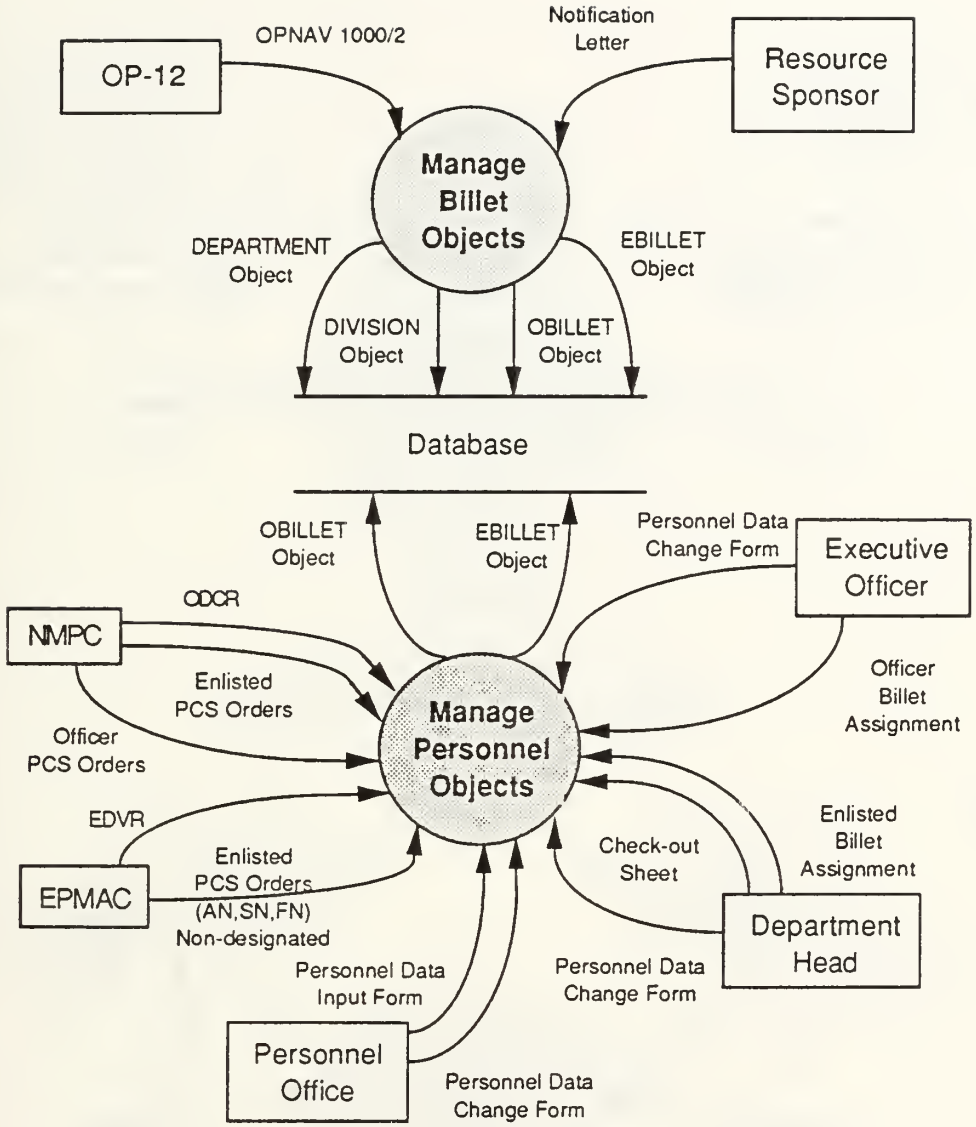
Figure C-2: Manage Manpower and Create Reports Processes Diagram



LEGEND

EDVR = Enlisted Distribution Verification Report
ODCR = Officer Distribution Control Report
PCS = Permanent Change of Station
AN, SN, FN = Airman, Seaman, Fireman

Figure C-3: Manage Manpower (Update Objects)

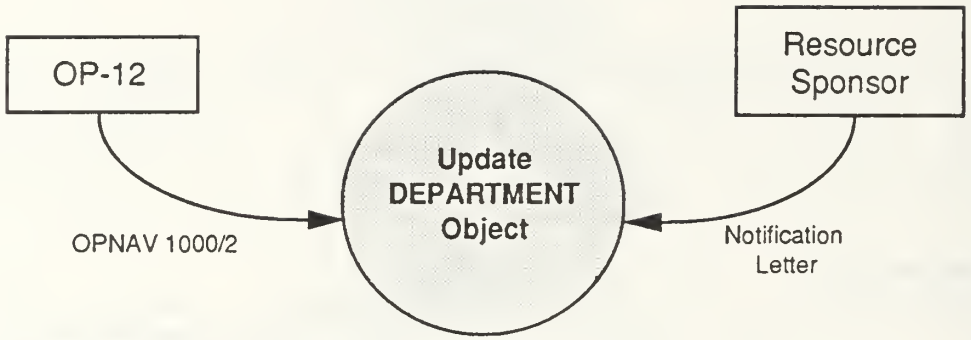


LEGEND

ODCR = Officer Distribution control Report
EDVR = Enlisted Distribution Verification Report
PCS = Permanent Change of Station
AN, SN, FN = Airman, Seaman, Fireman

Figure C-4: Manage Objects

(A)



(B)

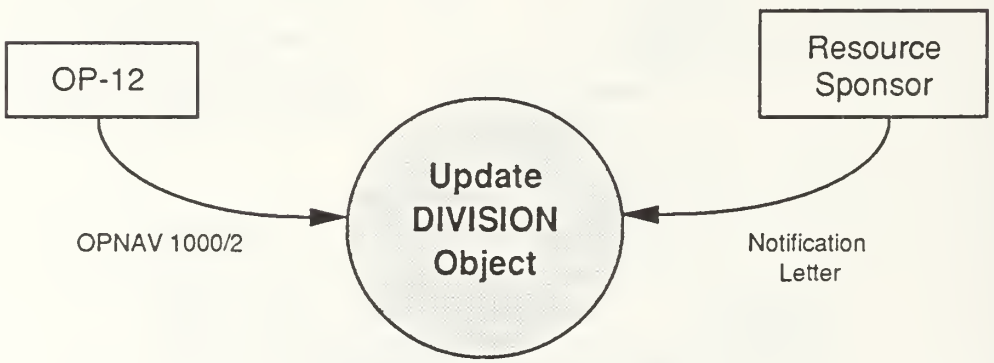


Figure C-5: Update DEPARTMENT and DIVISION Objects

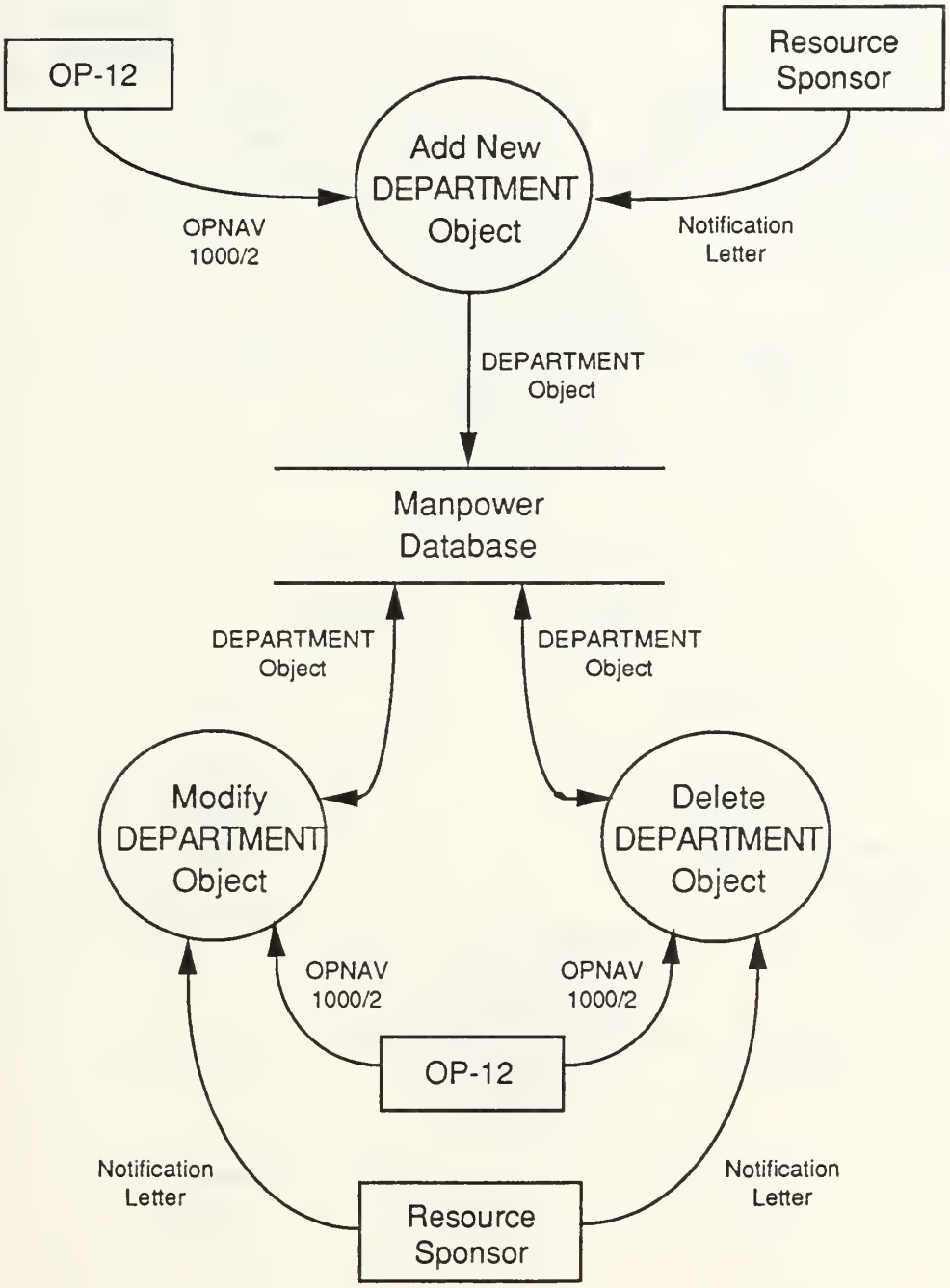


Figure C-6: Add, Modify, and Delete DEPARTMEMT Object

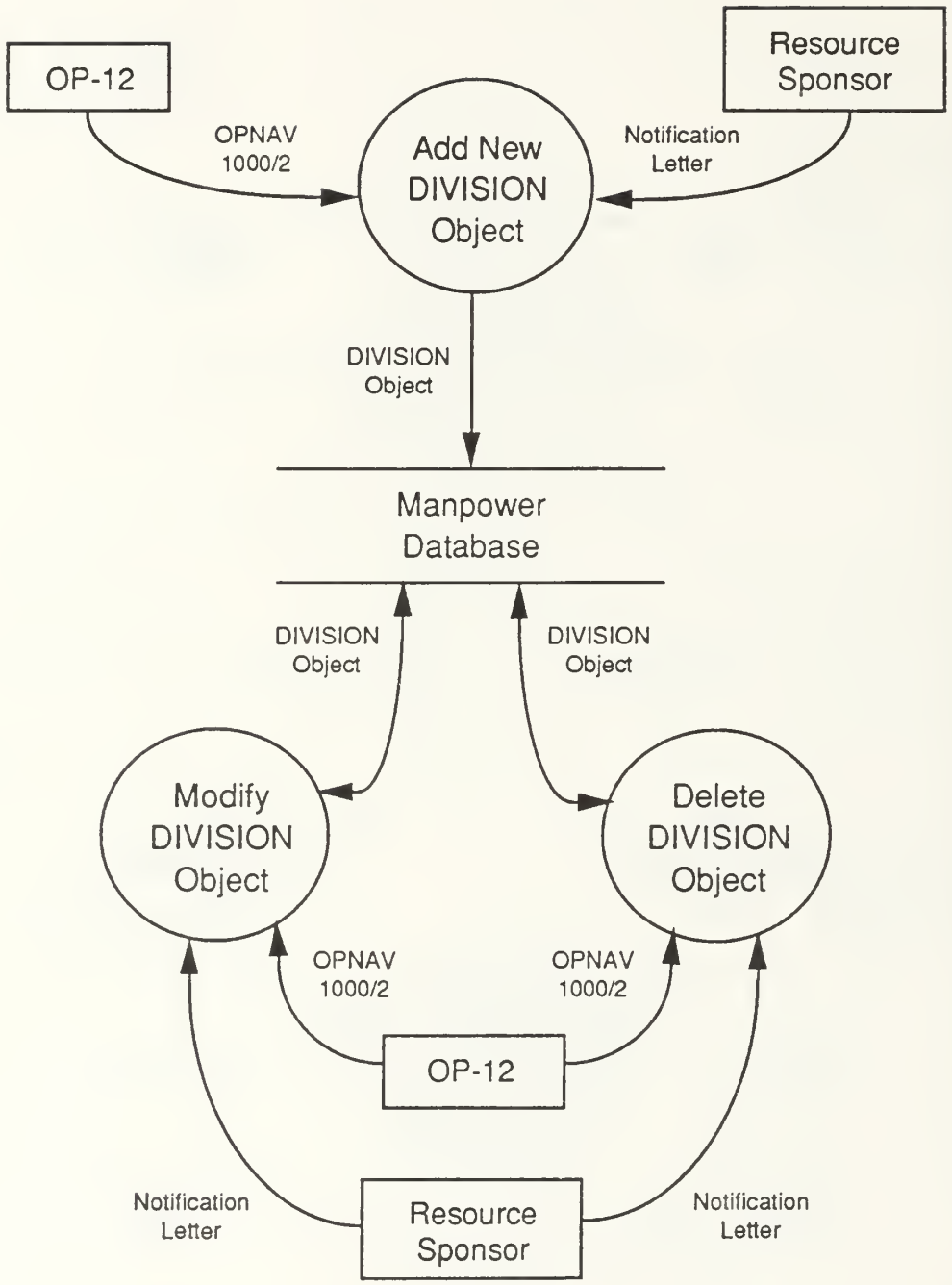
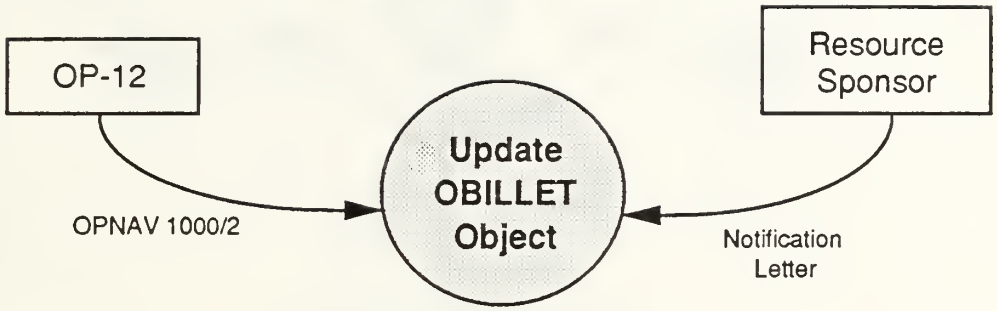


Figure C-7: Add, Modify, and Delete DIVISION Object

(A)



(B)

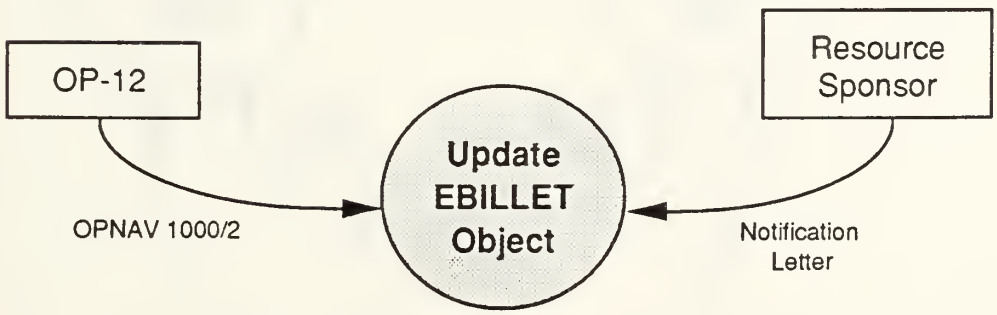


Figure C-8: Update OBILLET and EBILLET Objects

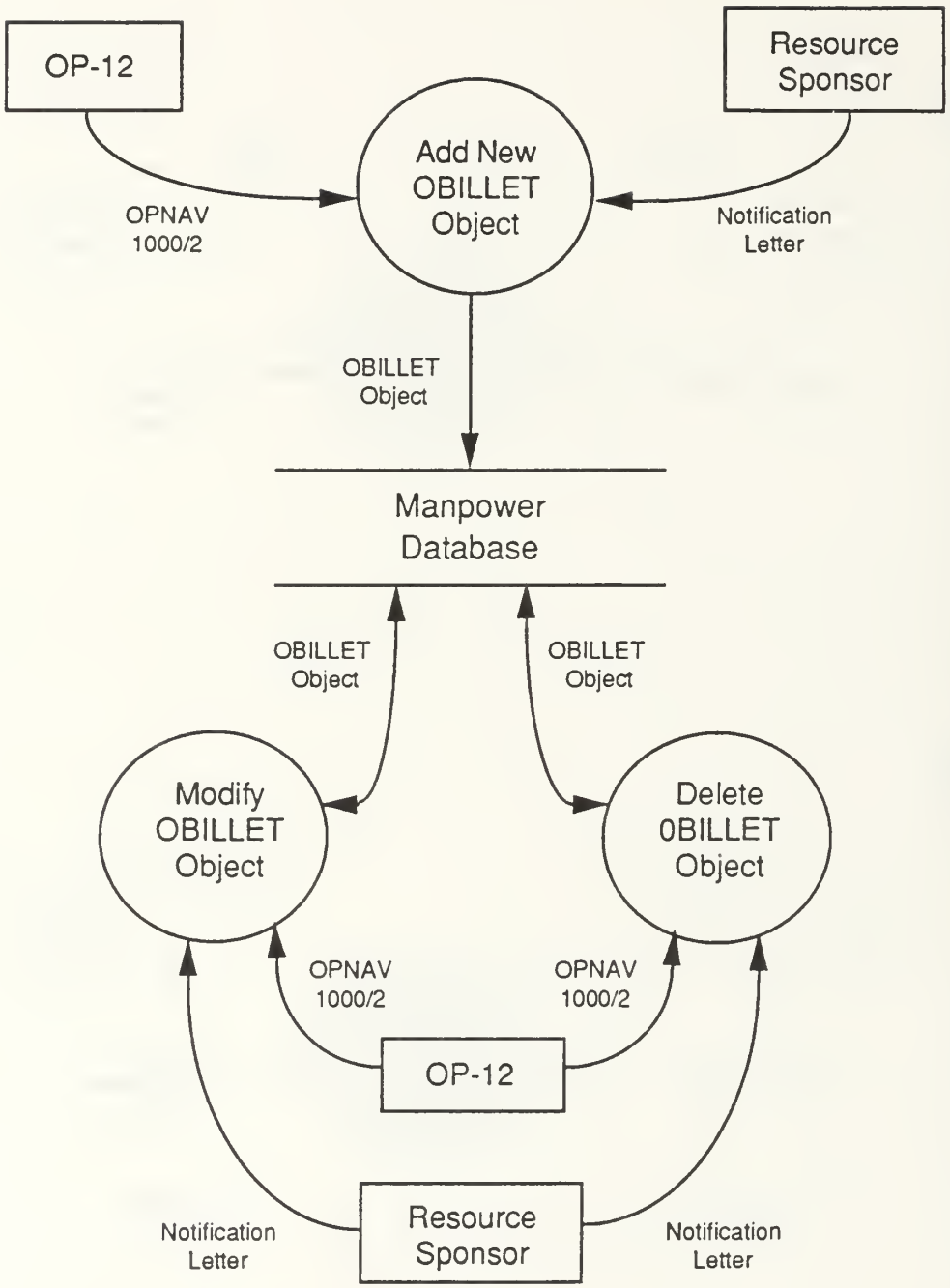


Figure C-9: Add, Modify, and Delete OBILLET Object

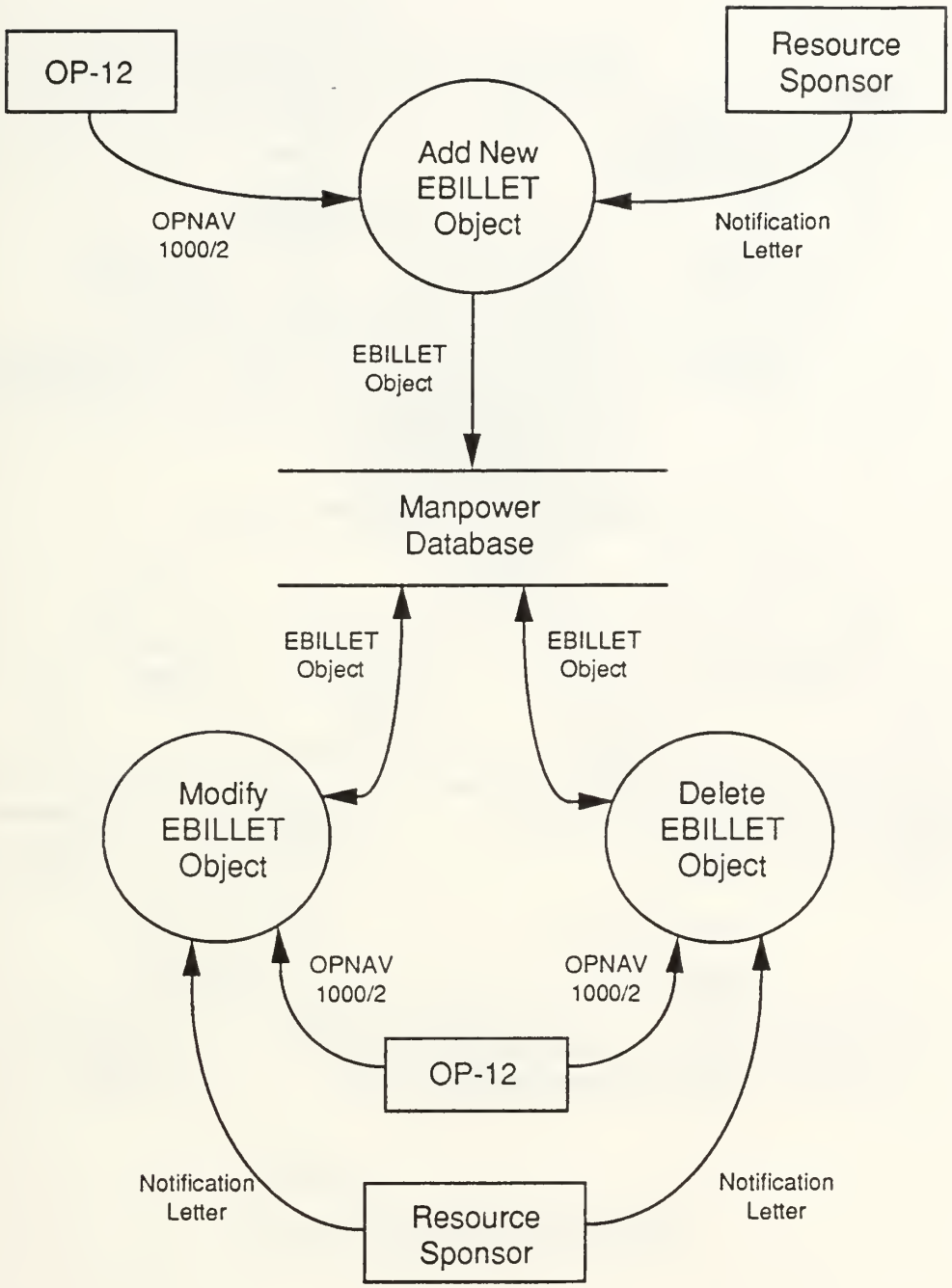
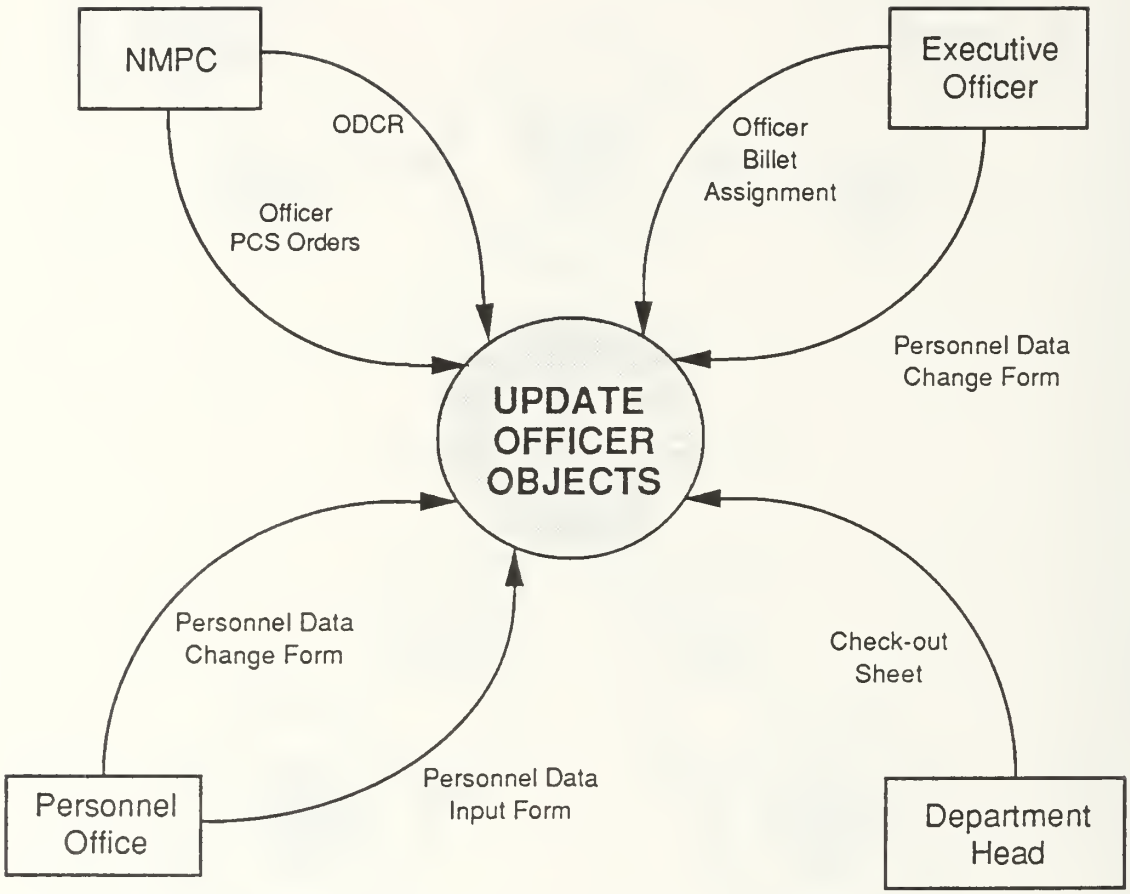


Figure C-10: Add, Modify, and Delete EBILLET Object



LEGEND

ODCR = Officer Distribution Control Report
PCS = Permanent Change of Station

Figure C-11: Update OFFICER Objects

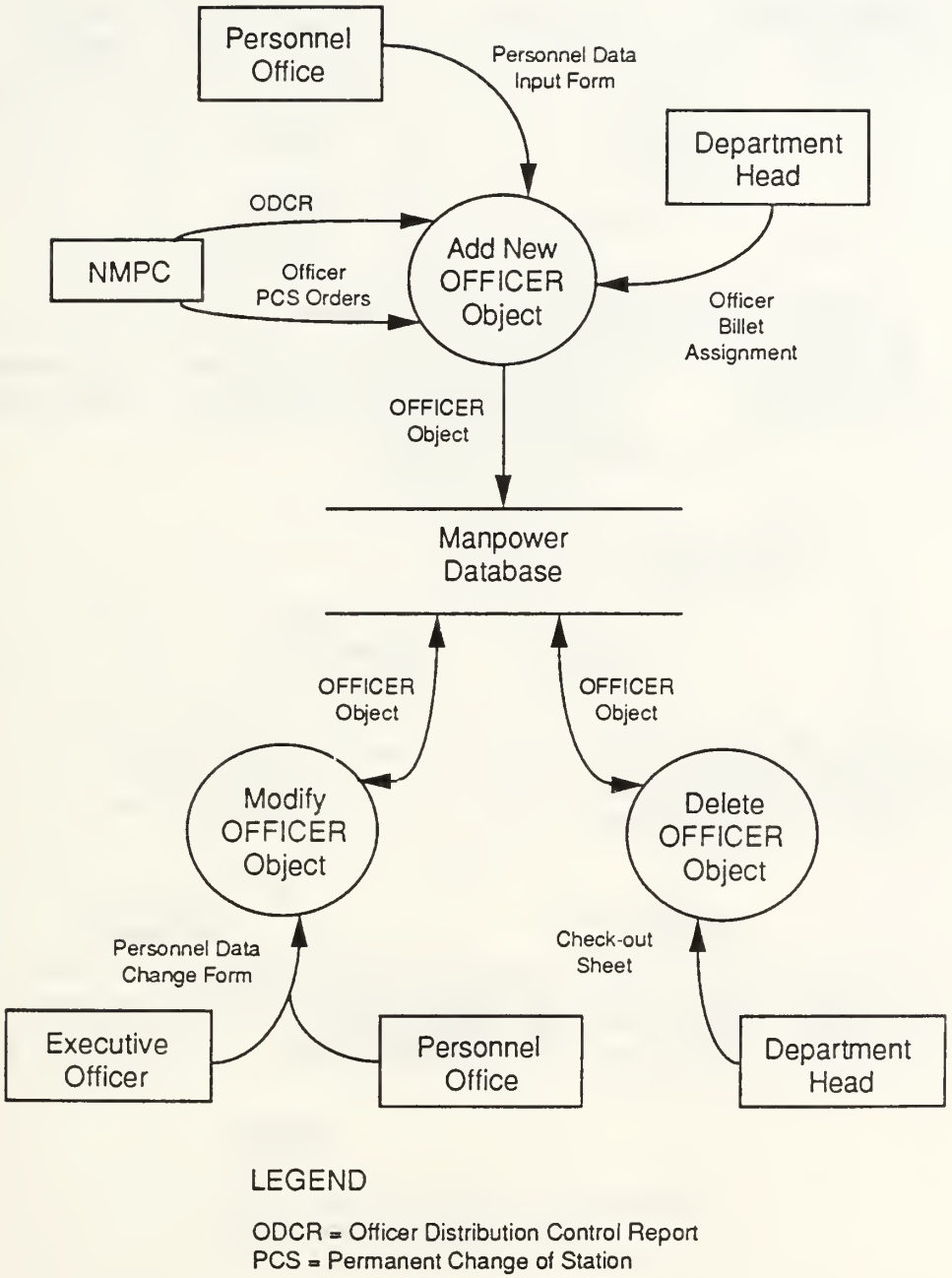
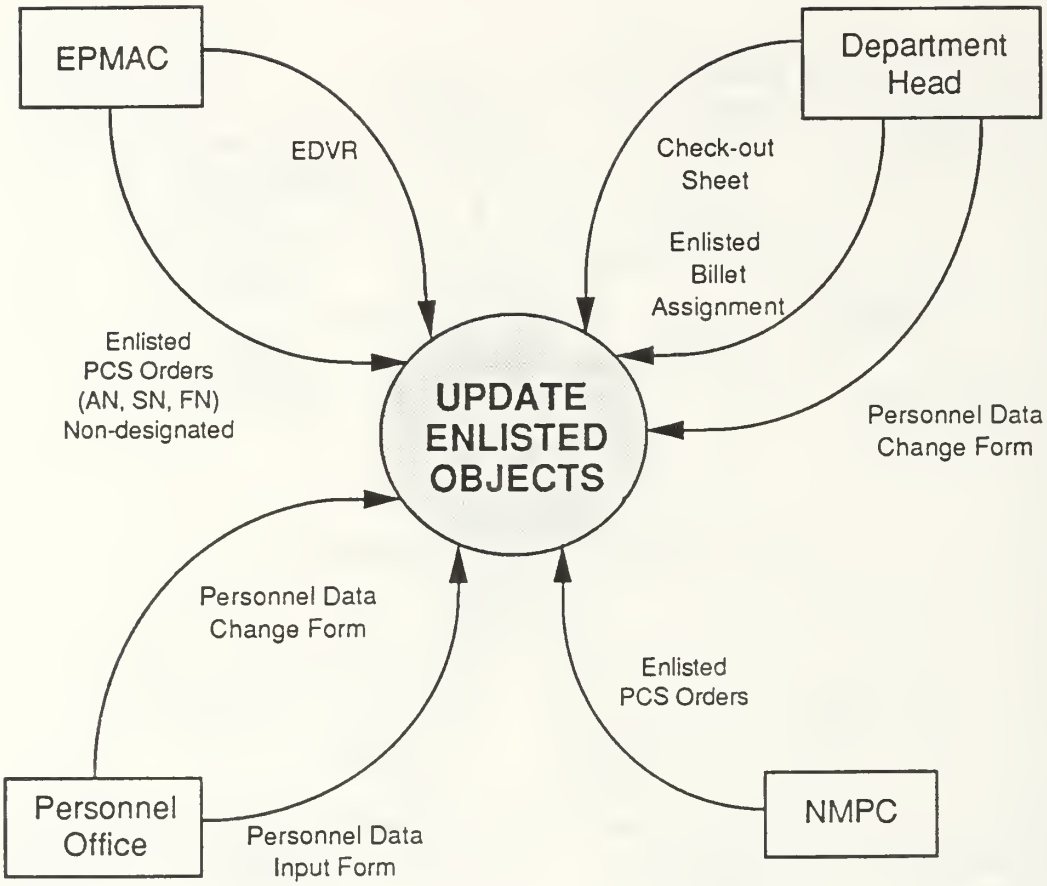


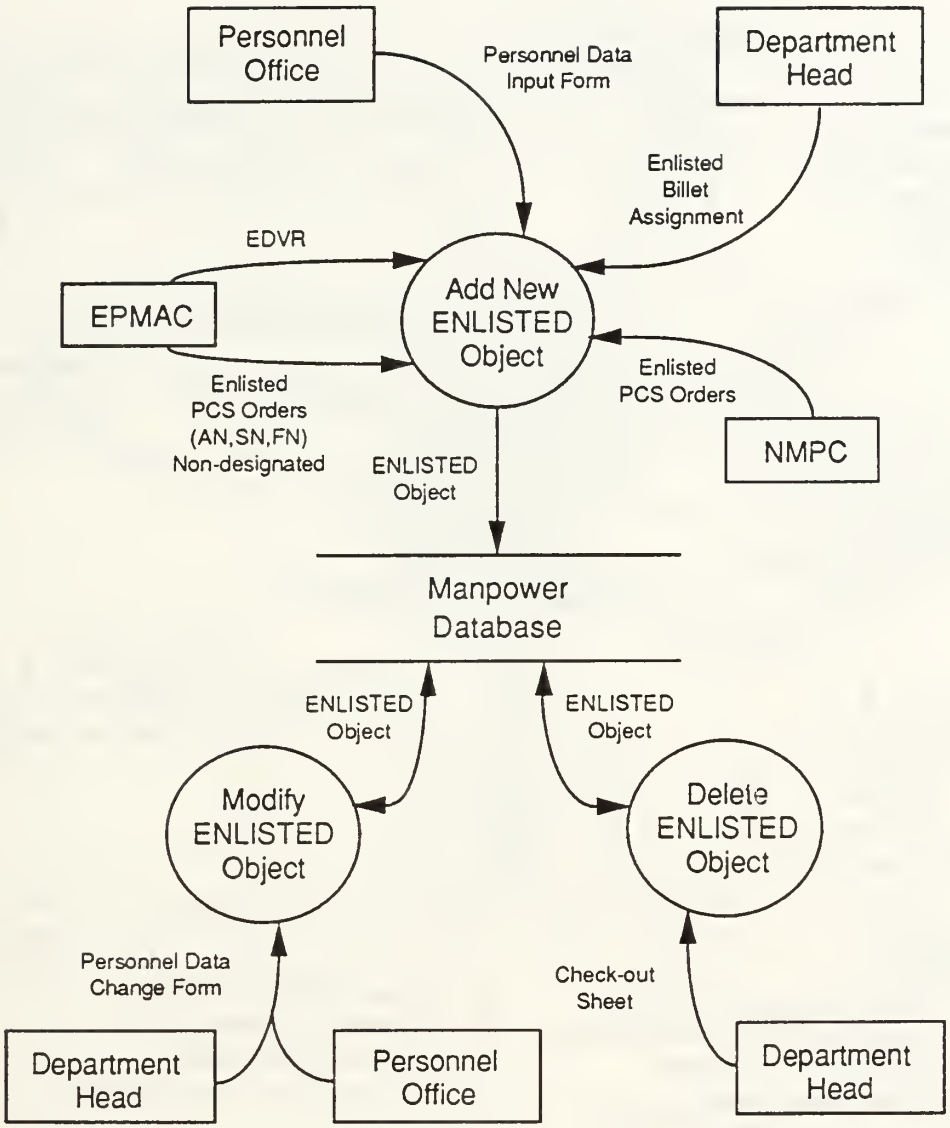
Figure C-12: Add, Modify, and Delete OFFICER Object



LEGEND

EDVR = Enlisted Distribution Verification Report
PCS = Permanent Change of Station
AN, SN, FN = Airman, Seaman, Fireman

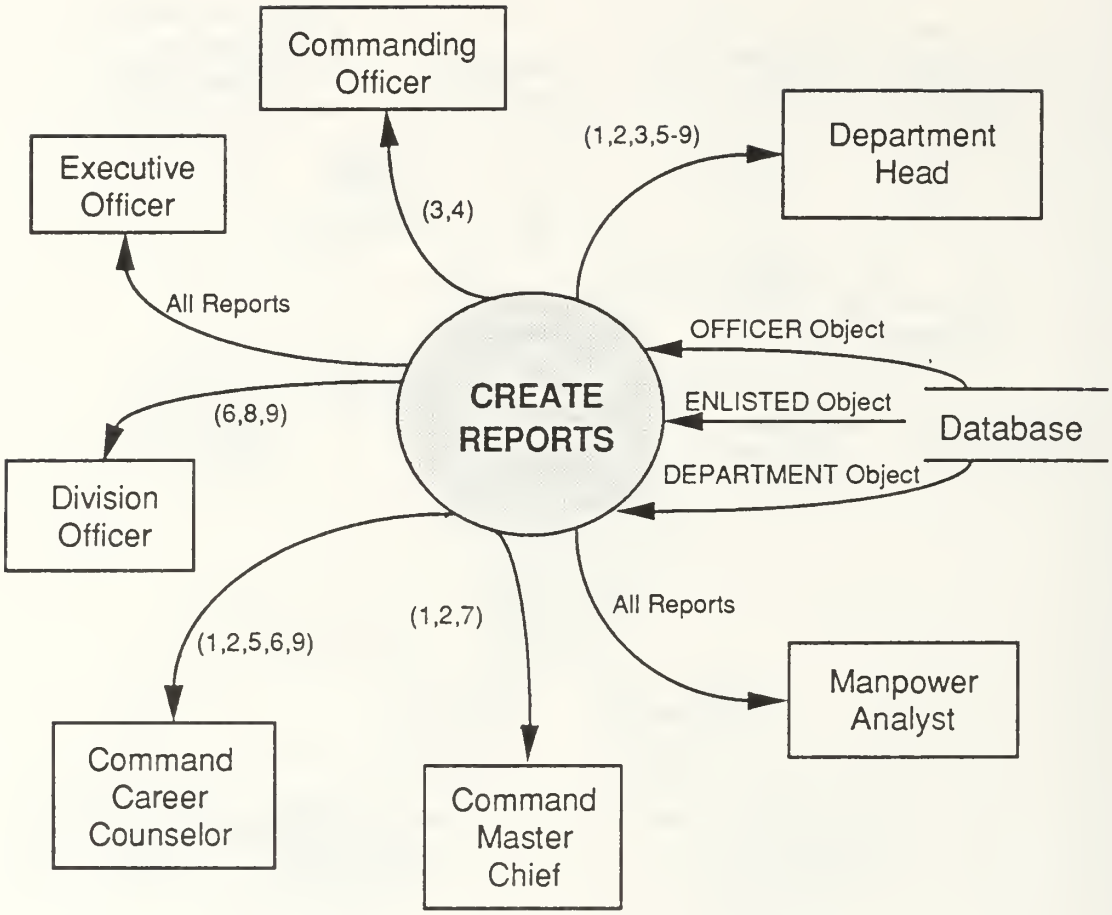
Figure C-13: Update ENLISTED Objects



LEGEND

EDVR = Enlisted Distribution Verification Report
PCS = Permanent Change of Station
AN, SN, FN = Airman, Seaman, Fireman

Figure C-14: Add, Modify, and Delete ENLISTED Objects



LEGEND

(1) Grade/Paygrade Status Report
(2) Designator/Rating Status Report
(3) Officer Manning Report
(4) Officer Status Report
(5) Department Manning Report
(6) Division Manning Report
(7) Department Status Report
(8) Division Status Report
(9) Personnel Gains/Losses Report

Figure C-15: Create Reports Process

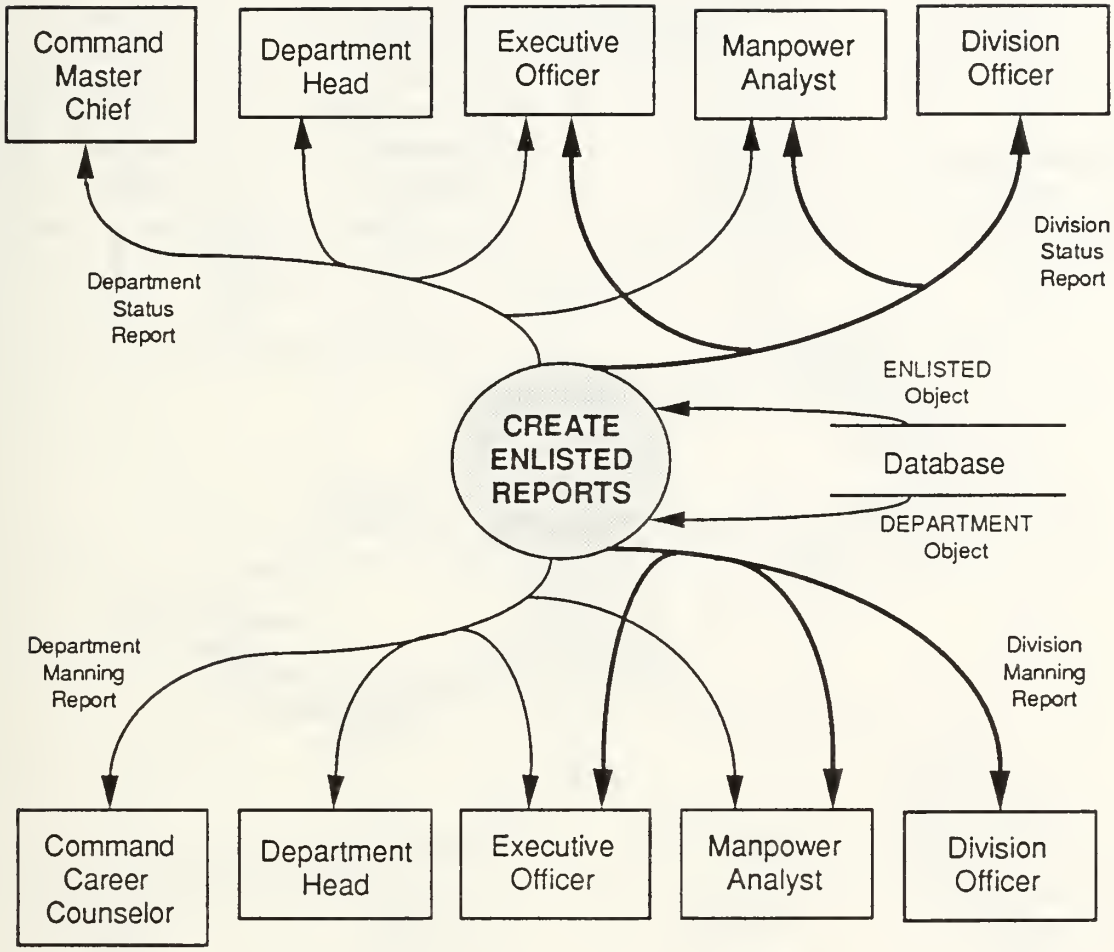


Figure C-16: Create Enlisted Reports

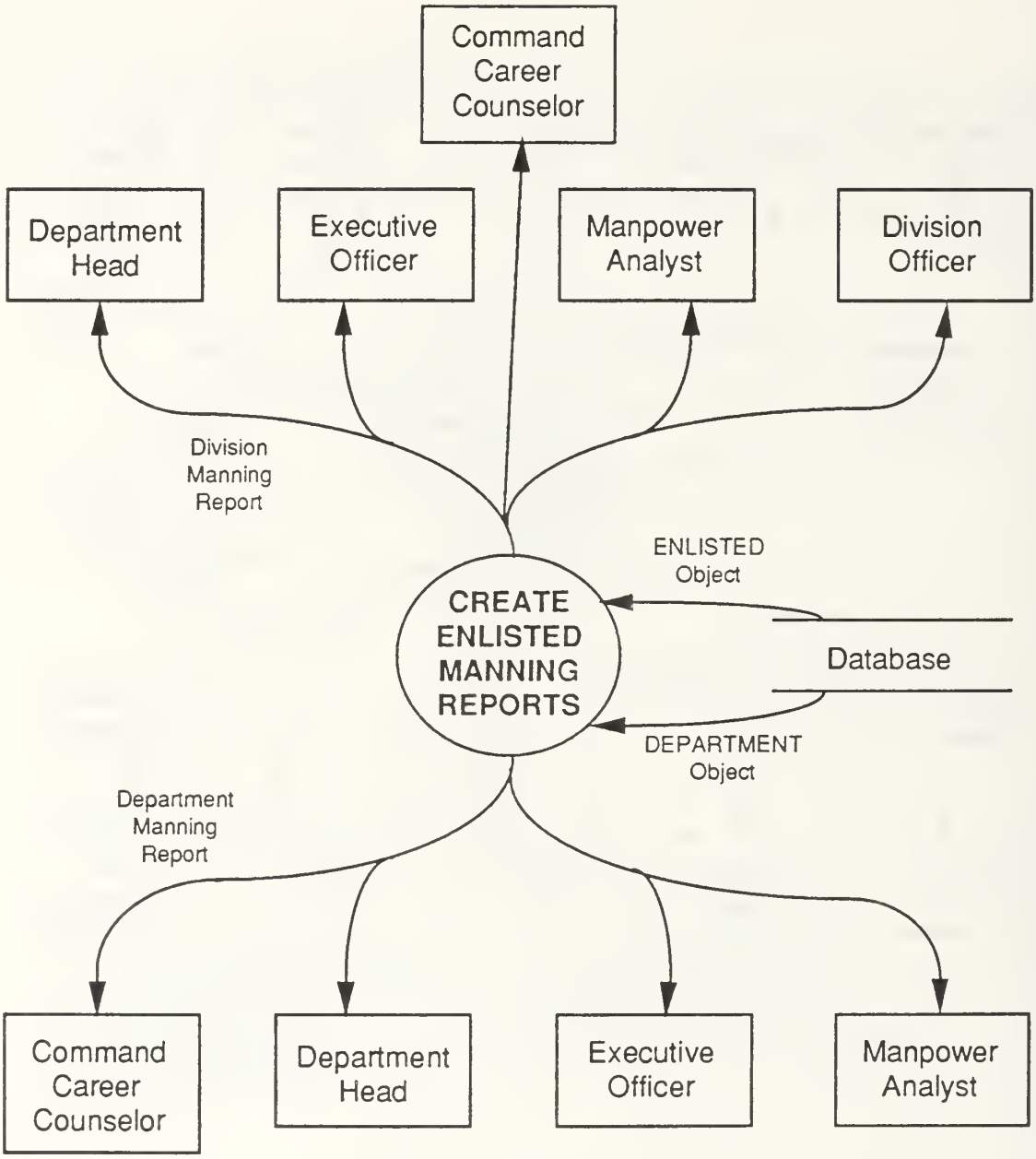


Figure C-17: Create Enlisted Manning Reports

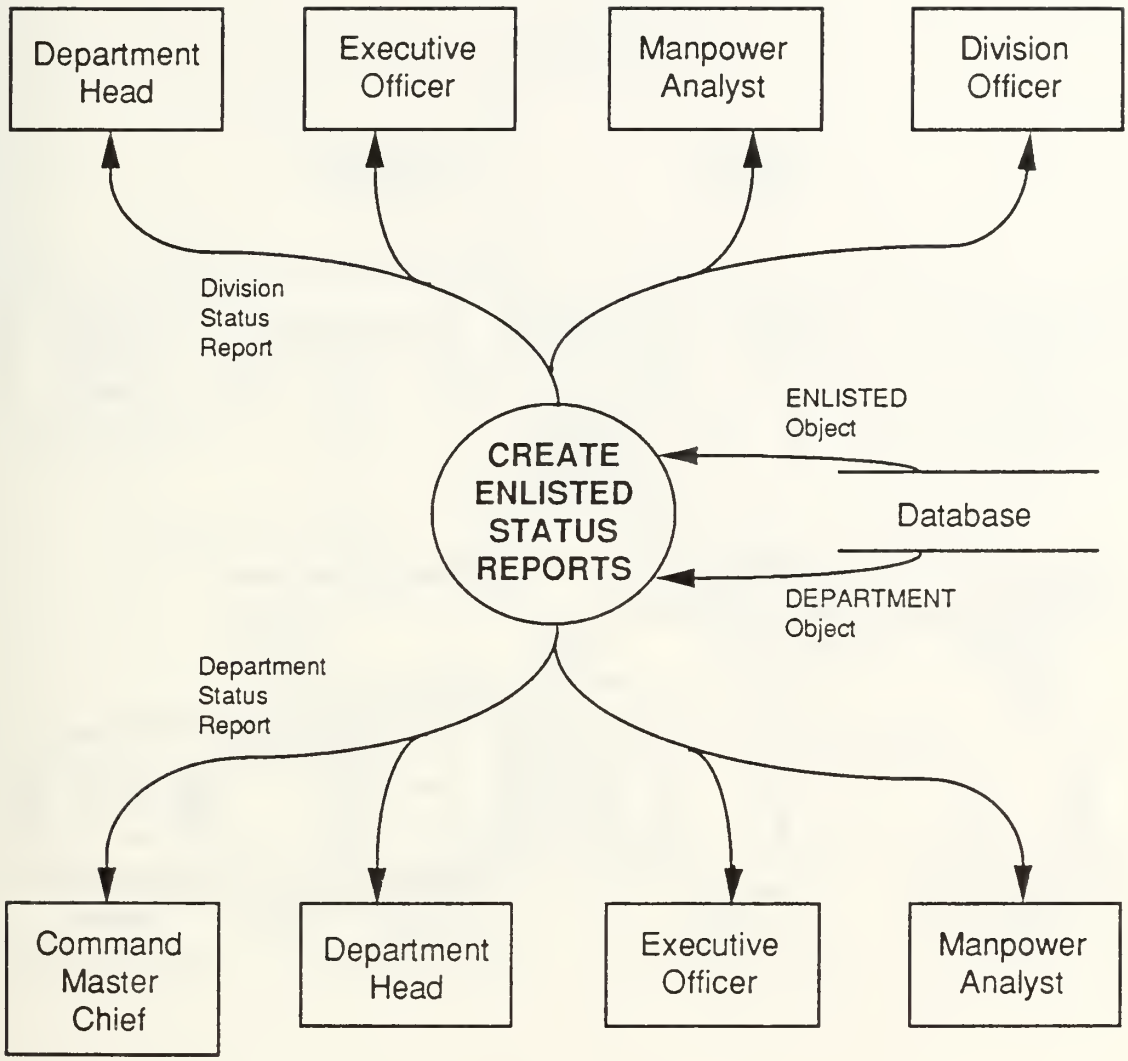


Figure C-18: Create Enlisted Status Reports

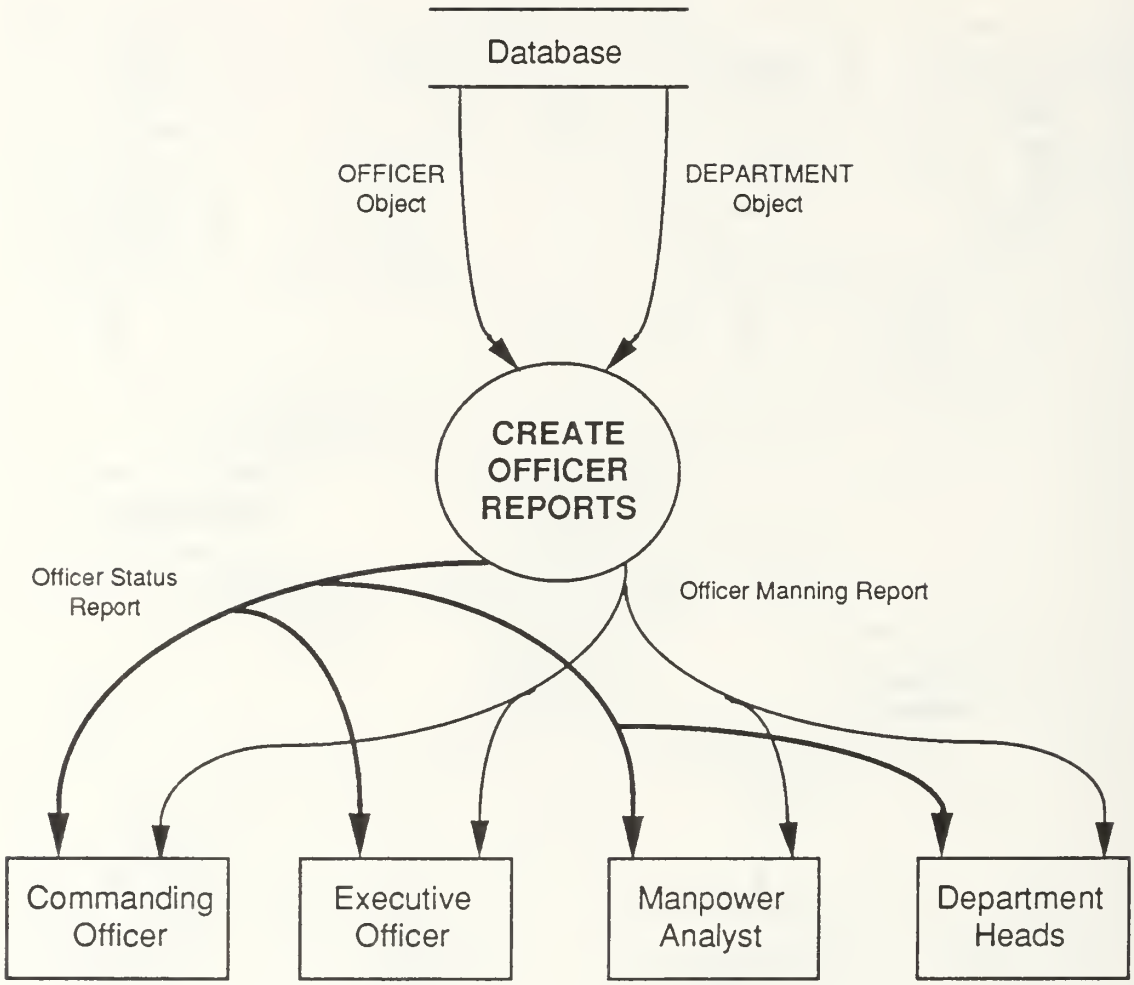


Figure C-19: Create Officer Reports

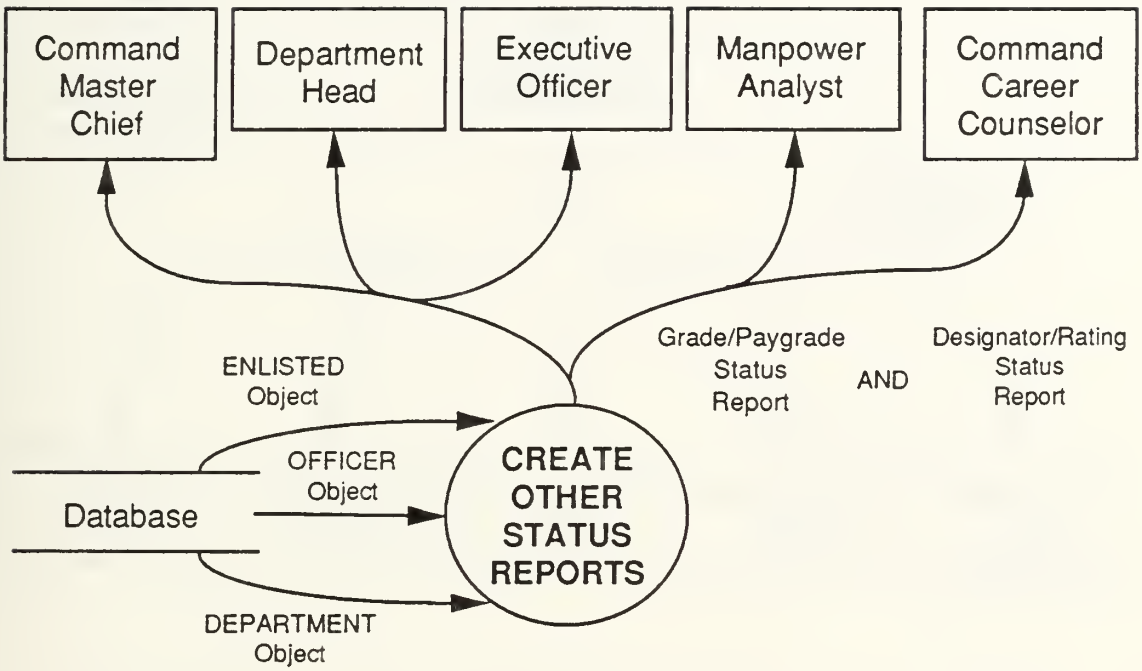


Figure C-20: Create Other Status Reports

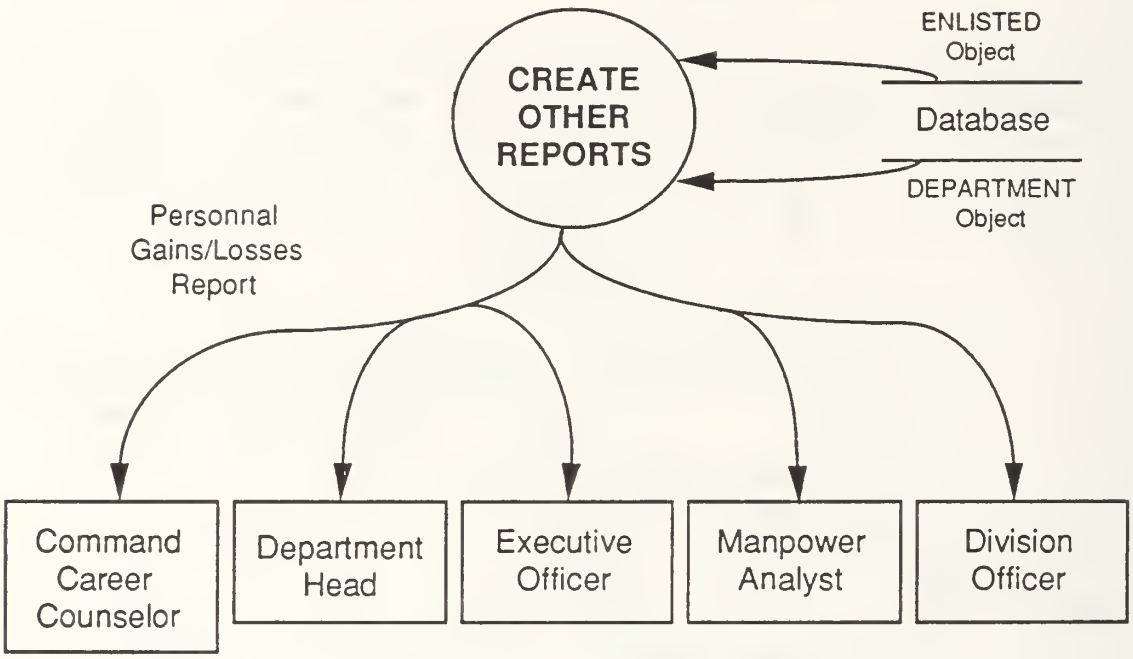


Figure C-21: Create Other Reports

APPENDIX D: SAMPLE FORMS AND REPORTS

ENLISTED PERSONNEL DATA INPUT/CHANGE FORM

Last Name _____ First Name _____ MI ___

Rating _____ Paygrade _____ Rate _____

PNEC _____ SNEC _____ SSN _____ PRD _____ TIR _____ TIS _____

Comments (Colaterial Duties, Watch Section, Qualifications) _____

(Enter RATING and PAYGRADE; system will enter RATE)

BILLET ASSIGNMENT

Department _____ Division _____

BSC _____ Billet Title _____

BILLET ASSIGNMENT

Department _____ Division _____

BSC _____ Billet Title _____

Do you wish to add, modify or delete another Enlisted Record? (A/M/D/NO)

Figure D-1: Enlisted Personnel Data Input/Change Form

ENLISTED BILLET DATA INPUT/CHANGE FORM

_____ _____
Department Division

_____ _____ _____ _____
BSC Billet Title Rating Paygrade

_____ _____ _____
Rate PNEC SNEC

_____ _____ _____ _____ _____ _____
BA FY+1 FY+2 FY+3 FY+4 FY+5

(Enter RATING and PAYGRADE; system will enter RATE)

Do you wish to add, modify, or delete an Enlisted Billet? (A/M/D/NO)

Figure D-2: Enlisted Billet Data Input/Change Form

OFFICER PERSONNEL DATA INPUT/CHANGE FORM

Last Name _____ First Name _____ MI ___

Grade _____ Desig _____ SSN _____ PRD _____ DOR _____

Comments (Colaterial Duties, Watch Section, Qualifications) _____

BILLET ASSIGNMENT

Department _____ Division _____

BSC _____ Billet Title _____

BILLET ASSIGNMENT

Department _____ Division _____

BSC _____ Billet Title _____

Do you wish to add, modify, or delete another Officer Record? (A/M/D/NO)

Figure D-3: Officer Personnel Data Input/Change Form

OFFICER BILLET DATA INPUT/CHANGE FORM

_____ _____

Department Division

_____ _____ _____ _____

BSC Billet Title Grade Desig

_____ _____ _____ _____ _____ _____

BA FY+1 FY+2 FY+3 FY+4 FY+5

Do you wish to add, modify, or delete an Officer Billet? (A/M/D/NO)

Figure D-4: Officer Billet Data Input/Change Form

DEPARTMENT MANNING REPORT **REPORT DATE**

DEPARTMENT: OPERATIONS *DIVISION: F DIVISION*

BSC	BILLET TITLE	RATE	PNEC SNEC	BA	NAME	RATE	PNEC SNEC	PRD/ EAOS
30060	Signalman	SM1		1	Jones, R.	SM1		9203/ 9406
30070	Signalman	SM2		2	Petty, T.	SM2		9212/ 9406
					Kart, E.	SM3		9303/ 9406

DEPARTMENT: OPERATIONS *DIVISION: DECK DIVISION*

55060	Boatsmate	BM1		1	Kennedy, C	BM1		9101/ 9203
55070	BM Basic	SN	9700	28	Jones, L.	BMSN		9212/ 9112
					Cathcart, M.	SN		9303/ 9406

DIVISION MANNING REPORT **REPORT DATE**

DEPARTMENT: OPERATIONS *DIVISION: F DIVISION*

BSC	BILLET TITLE	RATE	PNEC SNEC	BA	NAME	RATE	PNEC SNEC	PRD/ EAOS
30060	Signalman	SM1		1	Jones, R.	SM1		9203/ 9406
30070	Signalman	SM2		2	Petty, T.	SM2		9212/ 9112

Figure D-5: Department/Division Manning Report

OFFICER MANNING REPORT **REPORT DATE**

DEPARTMENT: OPERATIONS

BSC	BILLET TITLE	GRADE/DESIG	BA	NAME	GRADE/DESIG	PRD
30060	OPS Officer	LCDR 1300	1	Jones, R.	LCDR 1300	9406
	DIVISION: SCHEDULES					
30070	Scheduler	LT 1300	2	Petty, T.	LTJG 1305	9212
	DIVISION: DET 6					
30080	DET OIC	LCDR 1300	1	Kart, E.	LCDR 1300	9303
	DEPARTMENT: ADMINISTRATION					
55070	ADMIN Officer	LCDR 1300	1	Jones, L.	LCDR 1300	9212
55075	Legal Officer	LT 1100	1	Cathcart, M.	LT 1105	9303

*
*
*

Figure D-6: Officer Manning Report

GAINS / LOSSES REPORT **REPORT DATE**

GAINS

NAME	GRADE RATE	DESIG PNEC	EDA
Jones, R.	LT	1300	9002
Smith, M.	ENS	1100	9010
Carry, D.	ADCS		9008

LOSSES

NAME	GRADE RATE	DESIG PNEC	PRD
Calloway, T.	CDR	1300	9003
Mello, C.	LTJG	1310	9005

Figure D-7: Gains/Losses Report

DEPARTMENT STATUS REPORT **REPORT DATE**

DEPARTMENT: MAINTENANCE
DIVISION: MAINT/PROD CTL

BSC	BILLET TITLE	RATE	PNEC SNEC	BA	COB	POB1	POB2	POB3	POB4
16050	Maint Coord	ATCM	8300	1	1	1	1	1	1
16060	Maint Prod	ATCS		2	2	2	3	3	2

DIVISION: QUALITY ASSURANCE

18060	QA REP	AD1	8318	2	1	1	2	2	2
18070	QA REP	AMH1	8380	2	3	3	3	2	2

DIVISION: MATERIAL CONTROL

19060	MTL CLK	AK1		3	3	3	2	2	2

DIVISION STATUS REPORT **REPORT DATE**

DEPARTMENT: MAINTENANCE
DIVISION: POWER PLANTS]

BA	BILLET TITLE	RATE	PNEC SNEC	BA	COB	POB1	POB2	POB3	POB4
22070	P/P Repairman	AD2	8380	6	5	5	5	5	4
22080	P/P Repairman	AD3	8318	3	4	4	4	3	3

Figure D-8: Department/Division Status Report

OFFICER STATUS REPORT **REPORT DATE**

DEPARTMENT: SAFETY

BSC	BILLET	GRADE/DESIG		BA	COB	POB1	POB2	POB3	POB4
14010	AV Safety	LT	1311	1	1	1	1	1	0
14020	AV Safety Asst	LTJG	1311	1	1	1	1	1	1
14030	AV Safety Asst	ENS	1321	1	0	0	1	1	1

DEPARTMENT: MAINTENANCE
DIVISION: MAINT/PROD CTL

16010	A/C ORGMNT	ENS	1311	1	1	1	1	1	1

DIVISION: MAINT ADMIN

17010	A/C ORGMNT	ENS	1311	1	1	1	1	1	1

Figure D-9: Officer Status Report

GRADE/PAYGRADE STATUS REPORT **REPORT DATE**

COMMAND SUMMARY

OFFICER

GRADE	BA	COB	%	POB1	POB2	POB3	POB4	POB5	POB6	POB7
CAPT	1	1	100	1	1	2	1	1	1	1
CDR	3	3	100	3	3	3	3	3	3	3
LCDR	8	8	100	8	8	8	8	8	7	7
LT	20	18	92	21	21	20	20	20	22	22
LTJG	15	12	80	12	12	13	13	13	13	13
ENS	8	6	75	6	6	6	6	6	6	6
CWO 2-4	2	2	100	2	2	2	2	2	2	2
TOTAL	57	50	87.7	53	53	54	53	53	54	52

ENLISTED

PAYGRADE	BA	COB	%	POB1	POB2	POB3	POB4	POB5	POB6	POB7
E9	1	1	100	1	1	2	1	1	1	1
E8	4	3	75	3	3	3	3	3	3	3
E7	10	12	120	8	8	8	8	8	7	7
E6	24	20	83.3	21	21	20	20	20	22	20
E5	40	35	87.5	32	32	33	33	33	33	33
E4	50	42	84	6	6	6	6	6	6	6
E1-3	67	55	82	52	52	52	52	52	52	52
TOTAL	196	168	85.7	123	123	124	123	123	124	122

Figure D-10: Grade/Paygrade Status Report

DESIGNATOR / RATING STATUS REPORT **REPORT DATE**

DESIG	CAPT BA/COB	CDR	LCDR	LT	LTJG	ENS	CWO4	CWO3	CWO2	TOTAL
1310		1/1	2/2	3/2						6/5
1320					6/7					6/7
1311										0/0
1000					1/1					1/1
1100					2/1	1/1				3/2
1520										0/0
TOTAL		1/1	2/2	3/2	9/9	1/1				16/15

RATING	PNEC SNEC	E9	E8	E7	E6	E5	E4	E1-3	TOTAL
AD	6411				1/2	1/1	1/1	1/1	4/5
AD	6418				2/1		2/2		4/3
AD	6422				4/3	5/5	7/6	11/11	27/25
AD	8318			2/2	3/4		2/2		7/8
AD	8300				1/1	2/2	4/4	3/3	10/10
TOTAL				2/2	11/11	8/8	16/15	15/15	52/51

Figure D-11: Designator/Rating Status Report

APPENDIX E: RELATIONAL DIAGRAM

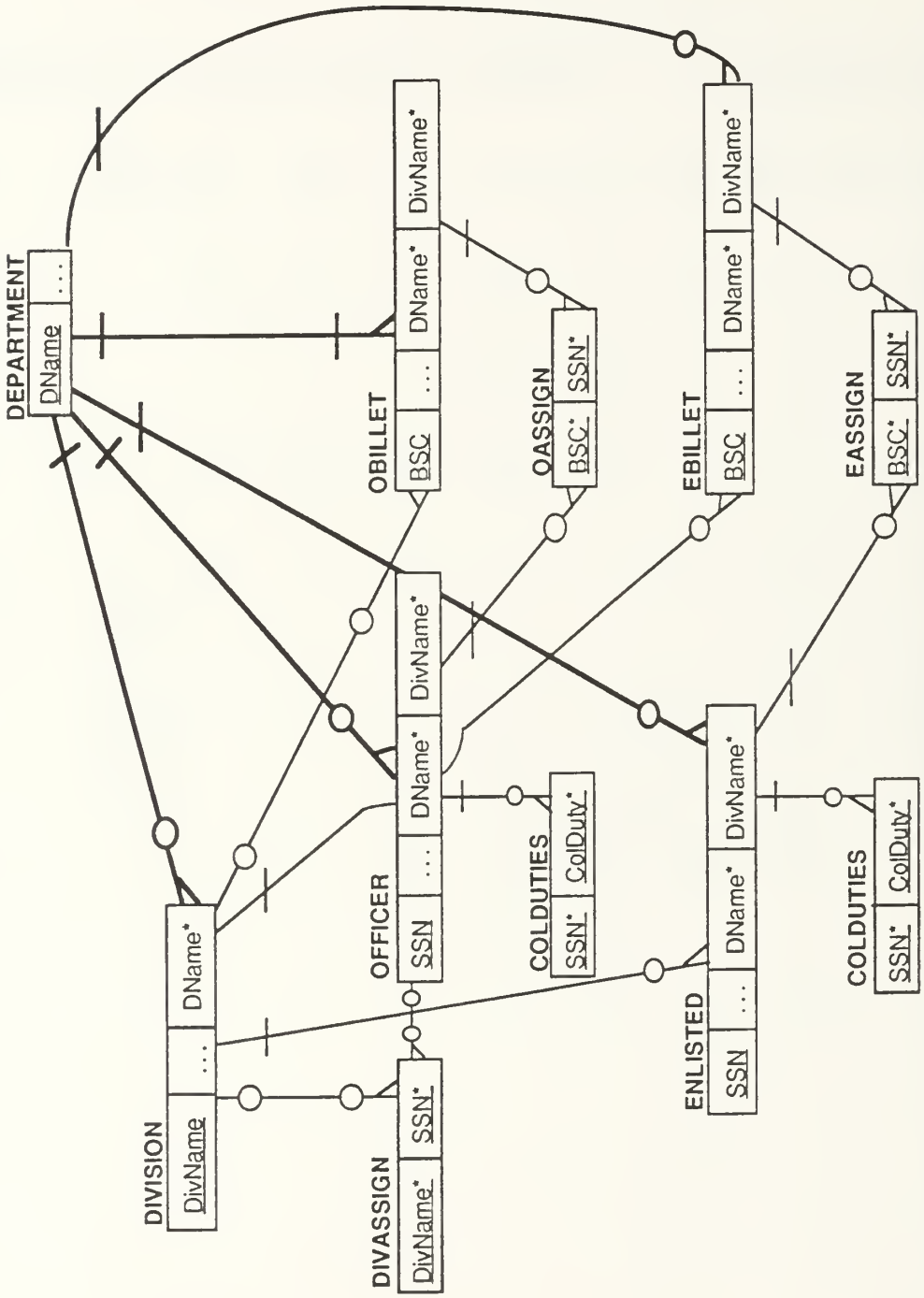


Figure E-1: Relational Diagram

APPENDIX F: RELATION DEFINITIONS

A. RELATION AND KEY DEFINITIONS

1. OFFICER (SSN, Name, Grade, Designator, PRD, Date of Rank, DName, DivName)

   Key: SSN

   Foreign Keys: DName, DivName)

2. ENLISTED (SSN, Name, Rating, Paygrade, Rate, PNEC, SNEC, PRD, EAOS, Date of Rate, Time in Service, DName, DivName)

   Key: SSN

   Foreign Keys: DName, DivName)

3. DEPARTMENT (DName)

   Key: DName

4. DIVISION (DivName, DName)

   Key: DivName

   Foreign Key: DName

5. OBILLET (BSC, Billet Title, Grade, Designator, BA(CUR), BA(FY1), BA(FY2), BA(FY3), BA(FY4), DName, DivName)

   Key: BSC

   Foreign Keys: DName, DivName

6. EBILLET (BSC, Billet Title, Rating, Paygrade, Rate, PNEC, SNEC, BA, DName, DivName)

Key: BSC

Foreign Keys: DName, DivName

7. OASSIGN (BSC, SSN)

   Key: BSC, SSN

8. EASSIGN (BSC, SSN)

   Key: BSC, SSN

9. COLDUTY (SSN, Collaterial Duties)

   Key: SSN, Collaterial Duty

B. DOMAIN DEFINITIONS

1.	BA	IN	NUM(4)
2.	Billet Title	IN	CHAR(20)
3.	BSC	IN	NUM(5)
4.	COB	IN	NUM(4)
5.	Date	IN	YYMMDD, YY = 00-99; MM = 1-12; DD = 1-31
6.	Date of Rank	IN	YYMMDD, YY = 00-30; MM = 0-11; DD = 0-30
7.	Date of Rate	IN	YYMMDD, YY = 00-30; MM = 0-11; DD = 0-30
8.	Designator	IN	NUM(4)
9.	DivName	IN	CHAR(15)
10.	DName	IN	CHAR(15)

11.	Grade	IN	CHAR(4); FADM, ADM, VADM, RDMU, RAML, CAPT, CDR, LCDR, LT, LTJG, ENS, CWO4, CWO3, or CWO2
12.	Name	IN	CHAR(40)
13.	NEC	IN	NUM(4)
14.	Paygrade	IN	CHAR(5); E9, E8, E7, E6, E5, E4, E1-E3
15.	PNEC	IN	NUM(4)
16.	POB	IN	NUM(4)
17.	PRD	IN	NUM(5); YYMM, A = "A" or blank, YY = 00-99, MM = 01-12
18.	Rate	IN	Char(5)
19.	Rating	IN	CHAR(5); XXXZZ, XXX is any enlisted rate and ZZ is one of: 1, 2, 3, C, CS, CM
20.	SNEC	IN	NUM(4)
21.	SSN	IN	NUM(9)

APPENDIX G: UPDATE, DISPLAY, AND CONTROL MECHANISMS

A. UPDATE MECHANISMS

1. OBILLET Update Mechanisms

   a. Add new OBILLET data

      (1) Inputs

      - List of authorized billets from OPNAV 1000/2 or Notification Letter from the appropriate Resource Sponsor.

      (2) Outputs

      - New OBILLET object instance in database.

      (3) Processing notes

      - Data imported enmasse when creating database.

      (4) Volume

      - 10 to 500 billets input when creating database.

      - Usually less than one per year.

      (5) Frequency

      - Once per year.

   b. Edit data in OBILLET

      1) Inputs

      - OBILLET object instance from database (including DEPARTMENT properties).

- OBILLET change data from OPNAV 1000/2 or Notification Letter from the appropriate Resource Sponsor.

(2) Outputs

- Modified object instance to database.
- Confirmation message on screen.

(3) Processing notes

- This function changes all OBILLET data.

(4) Volume

- Unpredictable, but changes rarely occur.

(5) Frequency

- Once per year.

c. Delete OBILLET data

(1) Inputs

- List of billets to delete from OPNAV 1000/2 or Notification Letter from the appropriate Resource Sponsor.
- OBILLET object instance from database.

(2) Outputs

- Confirmation message on screen.

(3) Processing notes

- Backup of existing object should be made prior to deletion.

(4) Volume

- Unpredictable, but deletions rarely occur.

(5) Frequency

- Less than once per year.

2. EBILLET Update Mechanisms

a. Add new EBILLET data

(1) Inputs

- List of authorized billets from OPNAV 1000/2 or Notification Letter from the appropriate Resource Sponsor.

(2) Outputs

- New EBILLET object instance in database.

(3) Processing notes

- Data imported enmasse when creating database.

(4) Volume

- 20 to 5000 billets input when creating database.

- Usually less than one per year.

(5) Frequency

- Once per year.

b. Edit data in EBILLET

(1) Inputs

- EBILLET object instance from database (including DEPARTMENT properties).

- EBILLET change data from OPNAV 1000/2 or Notification Letter from the appropriate Resource Sponsor.

(2) Outputs

- Modified object instance to database.
- Confirmation message on screen.

(3) Processing notes

- This function changes all EBILLET data.

(4) Volume

- Unpredictable, but changes rarely occur.

(5) Frequency

- Once per year.

c. Delete EBILLET data

(1) Inputs

- List of billets to delete from OPNAV 1000/2 or Notification Letter from the appropriate Resource Sponsor.
- EBILLET object instance from database.

(2) Outputs

- Confirmation message on screen.

(3) Processing notes

- Backup of existing object should be made prior to deletion.

(4) Volume

- Unpredictable, but deletions rarely occur.

(5) Frequency

- Less than once per year.

3. OFFICER Update Mechanisms

a. Add new OFFICER data

(1) Inputs

- List of new officer personnel from ODCR, PCS orders, or personnel input form from the Personnel Office.

(2) Outputs

- New OFFICER object instance in database.

(3) Processing notes

- Data imported enmasse when creating database.

(4) Volume

- 10 to 500 billets input when creating database.

- Five to 200 per year.

(5) Frequency

- Monthly.

b. Edit data in OFFICER

(1) Inputs

- OFFICER object instance from database (including OBILLET properties).

- OFFICER change data from personnel data change form from the Personnel Office or the Executive Officer.

(2) Outputs

- Modified object instance to database.

- Confirmation message on screen.

(3) Processing notes

- This function changes all OFFICER data.

(4) Volume

- Ten officers per month.

(5) Frequency

- Monthly.

c. Delete OFFICER data

(1) Inputs

- List of personnel to delete from the check out sheets received from the Department Head.

- OFFICER object instance from database.

(2) Outputs

- Confirmation message on screen.

(3) Processing notes

- Backup of existing object should be made prior to deletion.

(4) Volume

- Zero to ten per month.

(5) Frequency

- Monthly.

4. ENLISTED Update Mechanisms

a. Add new ENLISTED data

(1) Inputs

- List of new enlisted personnel from EDVR and PCS orders.

(2) Outputs

- New ENLISTED object instance in database.

(3) Processing notes

- Data imported enmasse when creating database.

(4) Volume

- 50 to 5000 billets input when creating database.
- Ten to 1500 per year.

(5) Frequency

- Weekly.

b. Edit data in ENLISTED

(1) Inputs

- ENLISTED object instance from database (including EBILLET properties).
- ENLISTED change data from personnel data change form from the Personnel Office or the Department Head.

(2) Outputs

- Modified object instance to database.
- Confirmation message on screen.

(3) Processing notes

- This function changes all ENLISTED data.

(4) Volume

- 100 enlisted personnel per month.

(5) Frequency

- Weekly.

c. Delete ENLISTED data

(1) Inputs

- List of personnel to delete from the check out sheets received from the Department Head.

- ENLISTED object instance from database.

(2) Outputs

- Confirmation message on screen.

(3) Processing notes

- Backup of existing object should be made prior to deletion.

(4) Volume

- Zero to 100 per month.

(5) Frequency

- Weekly.

5. DEPARTMENT Update Mechanisms

a. Add new DEPARTMENT data

(1) Inputs

- New DEPARTMENT list from OPNAV 1000/2 or Notification Letter from the appropriate Resource Sponsor.

(2) Outputs

- New DEPARTMENT object instance in database.

(3) Processing notes

- Data imported enmasse when creating database.

(4) Volume

- Four to ten departments input when creating database.
- Less than one per year.

(5) Frequency

- Less than annually.

b. Edit data in DEPARTMENT

(1) Inputs

- DEPARTMENT object instance from database (including DIVISION properties).
- DEPARTMENT change data from OPNAV 1000/2 or Notification Letter from the appropriate Resource Sponsor.

(2) Outputs

- Modified object instance to database.
- Confirmation message on screen.

(3) Processing notes

- This function changes all DEPARTMENT data.

(4) Volume

- Less than one per year.

(5) Frequency

- Less than annually.

c. Delete DEPARTMENT data

(1) Inputs

- List of departments to delete from OPNAV 1000/2 or Notification Letter from the appropriate Resource Sponsor.

- DEPARTMENT object instance from database.

(2) Outputs

- Confirmation message on screen.

(3) Processing notes

- Backup of existing object should be made prior to deletion.

(4) Volume

- Less than one per year.

(5) Frequency

- Less than annually.

6. DIVISION Update Mechanisms

a. Add new DIVISION data

(1) Inputs

- New DIVISION list from OPNAV 1000/2 or Notification Letter from the appropriate Resource Sponsor.

(2) Outputs

- New DIVISION object instance in database.

(3) Processing notes

- Data imported enmasse when creating database.

(4) Volume

- Five to 50 divisions input when creating database.

- Less than one per year.

(5) Frequency

- Less than annually.

b. Edit data in DIVISION

(1) Inputs

- DIVISION object instance from database (including OBILLET and EBILLET properties).

- DIVISION change data from OPNAV 1000/2 or Notification Letter from the appropriate Resource Sponsor.

(2) Outputs

- Modified object instance to database.

- Confirmation message on screen.

(3) Processing notes

- This function changes all DIVISION data.

(4) Volume

- Less than one per year.

(5) Frequency

- Less than annually.

c. Delete DIVISION data

(1) Inputs

- List of divisions to delete from OPNAV 1000/2 or Notification Letter from the appropriate Resource Sponsor.

- DIVISION object instance from database.

(2) Outputs

- Confirmation message on screen.

(3) Processing notes

- Backup of existing object should be made prior to deletion.

(4) Volume

- Less than one per year.

(5) Frequency

- Less than annually.

B. DISPLAY MECHANISMS

1. OFFICER Display Mechanisms

a. Query on OFFICER

(1) Output Description

- Form showing all data for an Officer.

(2) Source Data

- OFFICER object.

- DEPARTMENT object.

- Officer name or SSN keyed in by user.

(3) Processing Notes.

- Used by manpower analyst, or other authorized user.

(4) Volume

- Five per week.

(5) Frequency

- Daily.

b. Officer Manning Report

(1) Output Description

- Report showing Officer billets authorized and the Commissioned Officers assigned to them.

(2) Source Data

- OFFICER object.

- DEPARTMENT object.

(3) Processing Notes.

- Report produced upon request from user.

(4) Volume

- One for each department head, including Executive department.

(5) Frequency

- Monthly.

c. Officer Status Report

(1) Output Description

- Report showing Officer billets authorized and the number of personnel assigned to them.

(2) Source Data

- OFFICER object.

- DEPARTMENT object.

(3) Processing Notes.

- Report produced upon request from user.

(4) Volume

- One for each department head, including Executive department.

(5) Frequency

- Monthly

2. ENLISTED Display Mechanisms

a. Query on ENLISTED

(1) Output Description

- Form showing all data for an Enlisted member.

(2) Source Data

- ENLISTED object.

- DEPARTMENT object.

- Enlisted member's name or SSN keyed in by user.

(3) Processing Notes.

- Used by manpower analyst, or other authorized user.

(4) Volume

- Five per week per department.

(5) Frequency

- Daily.

b. Department/Division Manning Report

(1) Output Description

- Report showing Enlisted billets authorized and the personnel assigned to them.

(2) Source Data

- ENLISTED object.

- DEPARTMENT or DIVISION object.

(3) Processing Notes.

- Report produced upon request from user.

(4) Volume

- One for each department head, including Executive department.

(5) Frequency

- Monthly.

c. Department/Division Status Report

(1) Output Description

- Report showing Enlisted billets authorized and the number of personnel assigned to them.

(2) Source Data

- ENLISTED object.

- DEPARTMENT or DIVISION object.

(3) Processing Notes.

- Report produced upon request from user.

(4) Volume

- One for each department head, including Executive department.

(5) Frequency

- Monthly

3. Combined OFFICER/ENLISTED Display Mechanisms

a. Designator/Rating Status Report

(1) Output Description

- Report showing the quantity of billets authorized by designator and rating, and the number of personnel assigned within each.

(2) Source Data

- OFFICER object.

- ENLISTED object.

- DEPARTMENT or DIVISION object.

(3) Processing Notes.

- Report produced upon request from user.

(4) Volume

- One for each department, including Executive department.

(5) Frequency

- Monthly.

b. Paygrade Status Report

(1) Output Description

- Report showing the quantity of billets authorized by paygrade and the number of personnel assigned within each paygrade.

(2) Source Data

- OFFICER object.

- ENLISTED object.

- DEPARTMENT or DIVISION object.

(3) Processing Notes.

- Report produced upon request from user.

(4) Volume

- One for each department head, including Executive department.

(5) Frequency

- Monthly.

c. Personnel Gains/Losses Report

(1) Output Description

- Report showing the personnel ordered to the command but not yet received and personnel whose PRD is within three months of the report date.

(2) Source Data

- OFFICER object.

- ENLISTED object.

(3) Processing Notes.

- Report produced upon request from user.

(4) Volume

- One for each department head, including Executive department.

(5) Frequency

- Monthly

C. CONTROL MECHANISMS

1. System Control Mechanisms

a. Provide password system to ensure that only authorized users can access for viewing, editing, or deleting data.

b. Provide verification system to ensure that the authorized users have the opportunity to verify data prior to an instance of any object being stored in the database.

c. Provide verification system to ensure that the authorized users have the opportunity to verify data prior to an instance of any object being deleted from the database.

d. Provide security controls to ensure that data in the database cannot be altered from the Reports application.

2. Object Control Mechanisms

a. Provide a set of tables to ensure that only authorized data values for Rating, Rate, Paygrade, PNEC/SNEC, Grade, Designator, Billet Sequence Code, Department and Division Name are entered into data fields prior to an instance of an object being stored in the database.

b. Provide verification system to ensure that mandatory fields have values entered prior to an instance of an object being stored in the database.

APPENDIX H: MENU HIERARCHY

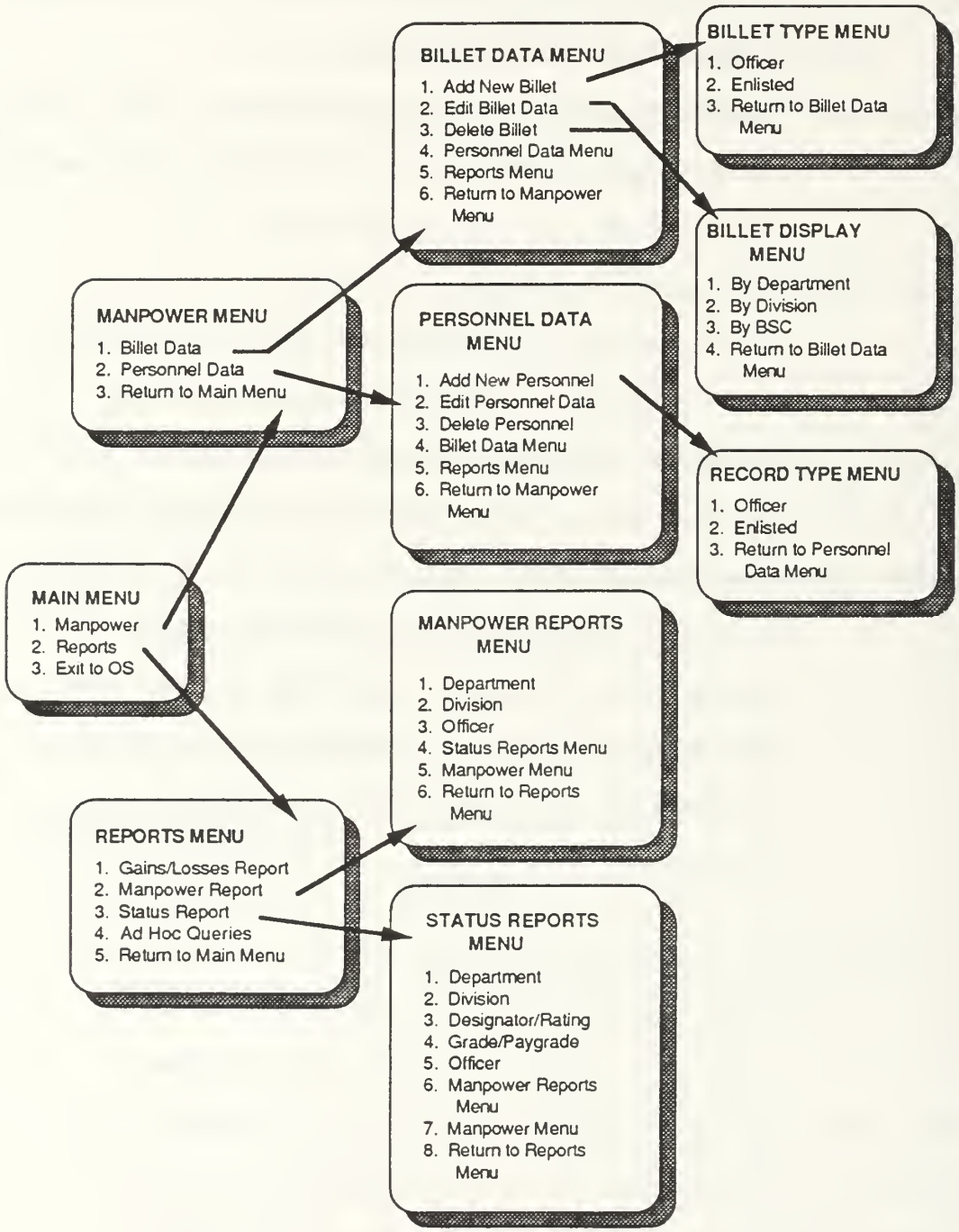


Figure H-1: Menu Tree

WELCOME TO

AMA/PMS

MAIN MENU

1. Manpower
2. Reports
3. Exit to OS

Enter the number of your selection _____

Figure H-2: Main Menu

AMA/PMS

MANPOWER MENU

1. Billet Data
2. Personnel Data
3. Return to Main Menu

Enter the number of your selection _____

Figure H-3: Manpower Menu

AMA/PMS

REPORTS MENU

1. Gains/Losses Report
2. Manpower Report
3. Status Report
4. Ad Hoc Queries
5. Return to Main Menu

Enter the number of your selection _____

Figure H-4: Reports Menu

AMA/PMS

BILLET DATA MENU

1. Add New Billet
2. Edit Billet Data
3. Delete Billet
4. Personnel Data Menu
5. Reports Menu
6. Return to Manpower Menu

Enter the number of your selection _____

Figure H-5: Billet Data Menu

AMA/PMS

PERSONNEL DATA MENU

1. Add New Personnel
2. Edit Personnel Data
3. Delete Personnel
4. Billet Data Menu
5. Reports Menu
6. Return to Manpower Menu

Enter the number of your selection _____

Figure H-6: Personnel Data Menu

AMA/PMS

MANPOWER REPORTS MENU

1. Department
2. Division
3. Officer
4. Status Reports Menu
5. Manpower Menu
6. Return to Reports Menu

Enter the number of your selection _____

Figure H-7: Manpower Reports Menu

AMA/PMS

STATUS REPORTS MENU

1. Department
2. Division
3. Designator / Rating
4. Grade/Paygrade
5. Officer
6. Manpower Reports Menu
7. Manpower Menu
8. Return to Reports Menu

Enter the number of your selection _____

Figure H-8: Status Reports Menu

AMA/PMS

BILLET TYPE MENU

1. Officer
2. Enlisted
3. Return to Billet Data Menu

Enter the number of your selection _____

Figure H-9: Billet Type Menu

AMA/PMS

BILLET DISPLAY MENU

1. By Department
2. By Division
3. By BSC
4. Return to Billet Data Menu

Enter the number of your selection _____

Figure H-10: Billet Display Menu

AMA/PMS

RECORD TYPE MENU

1. Officer
2. Enlisted
3. Return to Personnel Data Menu

Enter the number of your selection _____

Figure H-11: Record Type Menu

APPENDIX I: MENU LOGIC (PSEUDO CODE)

A. MAIN MENU

```
Begin (*module*)
    Case menu choice of:
        1:  Get MANPOWER MENU
        2:  Get REPORTS MENU
End(*module*)
```

B. MANPOWER MENU

```
Begin (*module*)
    Case menu choice of:
        1:  Get BILLET DATA MENU
        2:  Get PERSONNEL DATA MENU
        3:  Get MAIN MENU
End (*module*)
```

C. REPORTS MENU

```
Begin (*module*)
    Case menu choice of:
        1:  Get MANPOWER REPORTS MENU
        2:  Get STATUS REPORTS MENU
        3:  Get Gains/Losses Report (*procedure call*)
        4:  Get MAIN MENU
End (*module*)
```

```
D.  BILLET DATA MENU
    Begin (*module*)
        Case menu choice of:
            1:  Get BILLET TYPE MENU
            2:  Get BILLET DISPLAY MENU
            3:  Get BILLET DISPLAY MENU
            4:  Get REPORTS MENU
            5:  Get MANPOWER MENU
    End (*module*)
E.  PERSONNEL DATA MENU
    Begin (*module*)
        Case menu choice of:
            1:  Get RECORD TYPE MENU
            2:  Get Edit Personnel Data (*procedure call*)
                (*edit function handled by DBMS*)
            3:  Get Delete Personnel Data (*procedure call*)
                (*delete function handled by DBMS*)
            4:  Get REPORTS MENU
            5:  Get MANPOWER MENU
    End (*module*)
F.  MANPOWER REPORTS MENU
    Begin (*module*)
        Case menu choice of:
            1:  Get Department Manning Report (*procedure
                call*)
            2:  Get Division Manning Report (*procedure call*)
```

```
            3:  Get Officer Manning Report (*procedure call*)
            4:  Get MAIN MENU
            5:  Get REPORTS MENU
    End (*module*)
G.  STATUS REPORTS MENU
    Begin (*module*)
        Case menu choice of:
            1:  Get Department Status Report (*procedure
                call*)
            2:  Get Division Status Report (*procedure call*)
            3:  Get Designator/Rate Status Report (*procedure
                call*)
            4:  Get Paygrade Status Report (*procedure call*)
            5:  Get Officer Status Report (*procedure call*)
            6:  Get MANPOWER MENU
            7:  Get REPORTS MENU
    End (*module*)
H.  BILLET TYPE MENU
    Begin (*module*)
        Case menu choice of:
            1:  Get Add Officer Billet (*procedure call*)
                (*add function handled by DBMS*)
            2:  Get Add Enlisted Billet (*procedure call*)
                (*add function handled by DBMS*)
            3:  Get BILLET DATA MENU
    End (*module*)
```

I. BILLET DISPLAY MENU

Begin (*module*) (*display function handled by DBMS*)

Case menu choice of:

1: Get Display Department Billets (*procedure call*)

2: Get Display Division Billets (*procedure call*)

3: Get Display Billet By BSC (*procedure call*)

4: Get BILLET DISPLAY MENU

End (*module*)

J. RECORD TYPE MENU

Begin (*module*)

Case menu choice of:

1: Get New Officer Record (*procedure call*)

2: Get New Enlisted Record (*procedure call*)

3: Get PERSONNEL DATA MENU

End (*module*)

K. REPORT GENERATION PROCEDURES

1. Department/Division Manning Report

a. Display data by Department then by Division.

b. Records/Fields used:

1) EBILLET/BSC, Billet Title, BA, Rate, PNEC, SNEC, DName, DivName

2) ENLISTED/BSC, Name, Rate, PNEC, SNEC, PRD, EAOS

c. Sort EBILLET records by DName, DivName.

d. For each BSC in EBILLET, compare and match ENLISTED records to EBILLET records by keying on BSC.

e. Print data per report format in Appendix D.

2. Department/Division Status Report

a. Display data by Department then by Division.

b. Records/Fields used:

1) EBILLET/BSC, Billet Title, BA Rate, PNEC, SNEC, DName, DivName

2) ENLISTED/BSC, PRD, EAOS

c. Sort EBILLET records by DName, DivName.

d. For each BSC in EBILLET, compare and match ENLISTED records to EBILLET records by keying on BSC.

f. Using ENLISTED records calculate number of personnel on board for each BSC for the current month and for each of the next four (4) months. (For each BSC in ENLISTED record, if EAOS < PRD, use EAOS to determine projected on board; else use PRD.)

g. Print data per report format in Appendix D.

3. Officer Manning Report

a. Display data by Department then by Division.

b. Records/Fields used:

1) OBILLET/BSC, Billet Title, BA, Grade, Designator, DName, DivName

2) OFFICER/BSC, Name, Grade, Designator, PRD

c. Sort OBILLET records by DName, DivName.

d. For each BSC in OBILLET, compare and match OFFICER records to OBILLET records by keying on BSC.

e. Print data per report format in Appendix D.

4. Officer Status Report

a. Display data by Department then by Division.

b. Records/Fields used:

1) OBILLET/BSC, Billet Title, Grade, Designator, BA, DName, DivName

2) OFFICER/BSC, PRD

c. Sort records on BSC.

d. For each BSC in OBILLET, determine the number of OFFICERS assigned against it for current month and each of the next four (4) months.

e. Print data per report format in Appendix D.

5. Grade/Paygrade Status Report

a. Records/Fields used:

1) OBILLET/Grade, BA

2) OFFICER/Grade, PRD

3) EBILLET/Paygrade, BA

4) ENLISTED/Paygrade, PRD, EAOS

b. Sort OBILLET and OFFICER records on Grade.

c. Sort EBILLET and ENLISTED records on Paygrade.

d. Calculate - OFFICER PAYGRADE STATUS REPORT

1) Using OBILLET records, count number of BA for each Grade.

2) Using OFFICER records, count number of each Grade currently assigned.

3) Calculate percent of BA currently filled for each Grade (COB/BA).

4) Using the PRD field of OFFICER record, calculate the number of each Grade on board for the current month and for each of the next seven (7) months.

e. Calculate - ENLISTED PAYGRADE STATUS REPORT

1) Using EBILLET records, count number of BA for each Paygrade.

2) Using ENLISTED records, count number of each Paygrade currently assigned.

3) Calculate percent of BA currently filled for each Paygrade (COB/BA).

4) Using the PRD or EAOS field of ENLISTED record, calculate the number of each Paygrade on board for the current month and for each of the next seven (7) months. (For each ENLISTED record, if EAOS < PRD, use EAOS to determine projected on board; else use PRD.

f. Print data per report format in Appendix D.

6. Designator/Rating Status Report

a. Display data by Designator and Rating

b. Records/Fields used:

1) OBILLET/Grade, BA, Designator

2) OFFICER/Grade, Designator

3) EBILLET/BA, PNEC, SNEC, Rating, Paygrade

4) ENLISTED/PNEC, Rate

c. Sort OBILLET and OFFICER records on Designator.

d. Sort EBILLET and ENLISTED records on Rate, then by PNEC (if one is assigned).

e. Calculate - DESIGNATOR STATUS REPORT

1) Using OBILLET records: For each Designator in OBILLET, count number of BA in each Grade.

2) Using OFFICER records: For each Designator in OFFICER, count number of personnel on board in each Grade.

f. Calculate - RATING STATUS REPORT

1) Using EBILLET records:

a) For each Rating in EBILLET, count number of BA for each Paygrade.

b) Subdivide each Rating by PNEC if one is assigned.

2) Using ENLISTED records:

a) For each Rate in ENLISTED, count number of personnel currently on board.

b) Subdivide each Rate by PNEC if one is assigned.

g. Print data per report format in Appendix D.

7. Gains/Losses Report

a. Records/Fields used:

1) OFFICER/Name, Grade, Designator, PRD

2) ENLISTED/Name, Rate, PNEC, PRD, EAOS

b. Sort records by PRD.

c. Calculate - GAINS REPORT

1) Using OFFICER and ENLISTED records, identify those personnel who will be arriving at the activity within the next six (6) months. (This date will be reflected in the PRD field with an "A" as the first digit.)

d) Calculate - LOSSES REPORT

1) Using OFFICER and ENLISTED records, identify those personnel who will be departing the activity within the next six (6) months. (For each ENLISTED record, if EAOS < PRD, use EAOS to determine projected on board; else use PRD.)

e. Print data per report format in Appendix D.

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